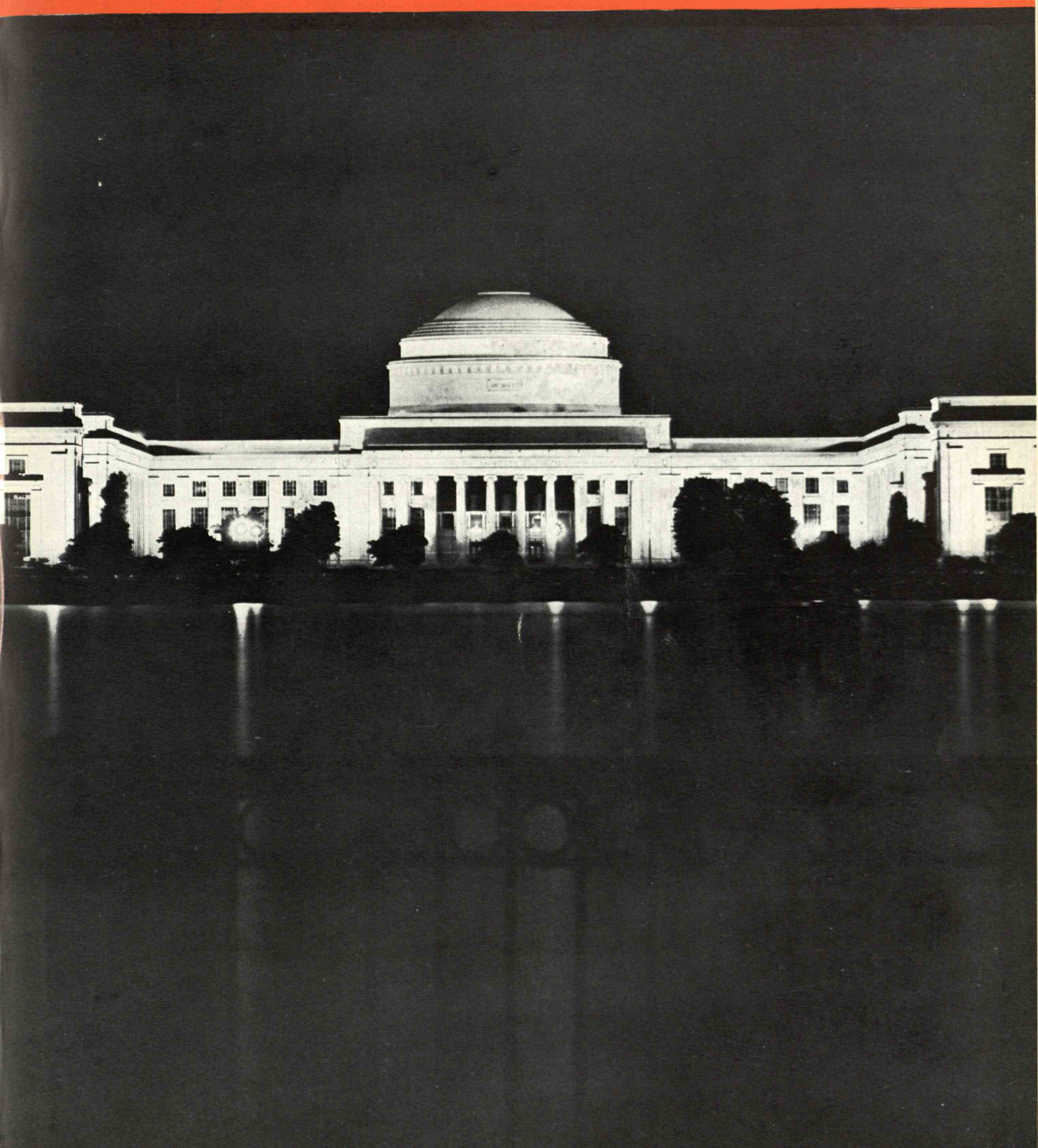
May 1932

TECHNOLOGY REVIEW



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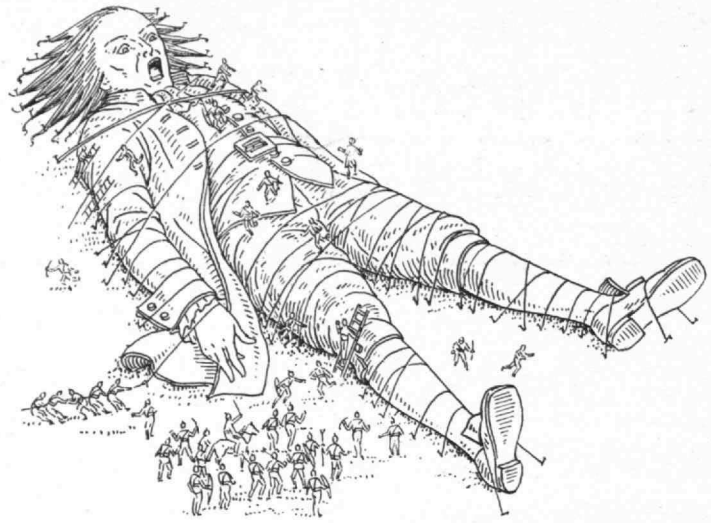
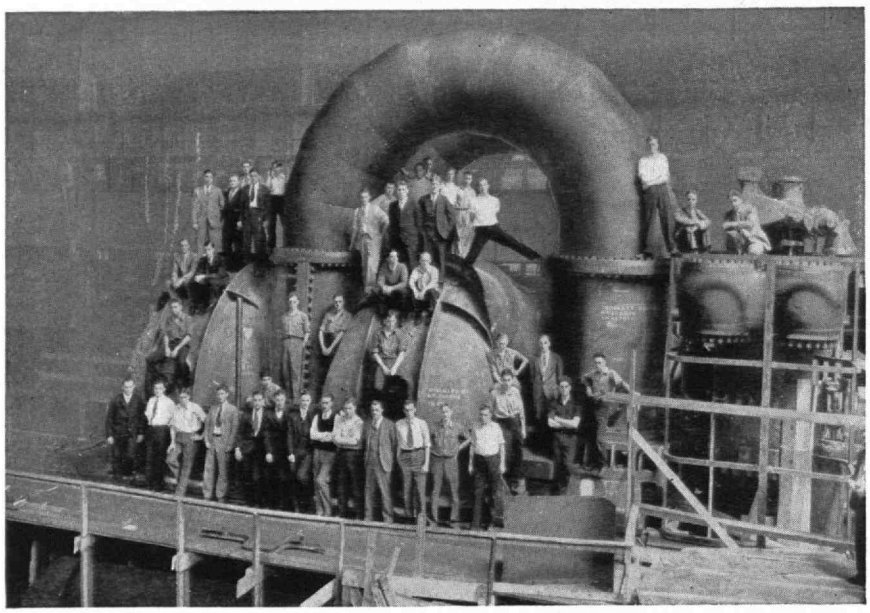


An Electrical GULLIVER AMONG LILLIPUTIANS?



160,000-kw. G-E tandem-compound turbine-generator set on test.

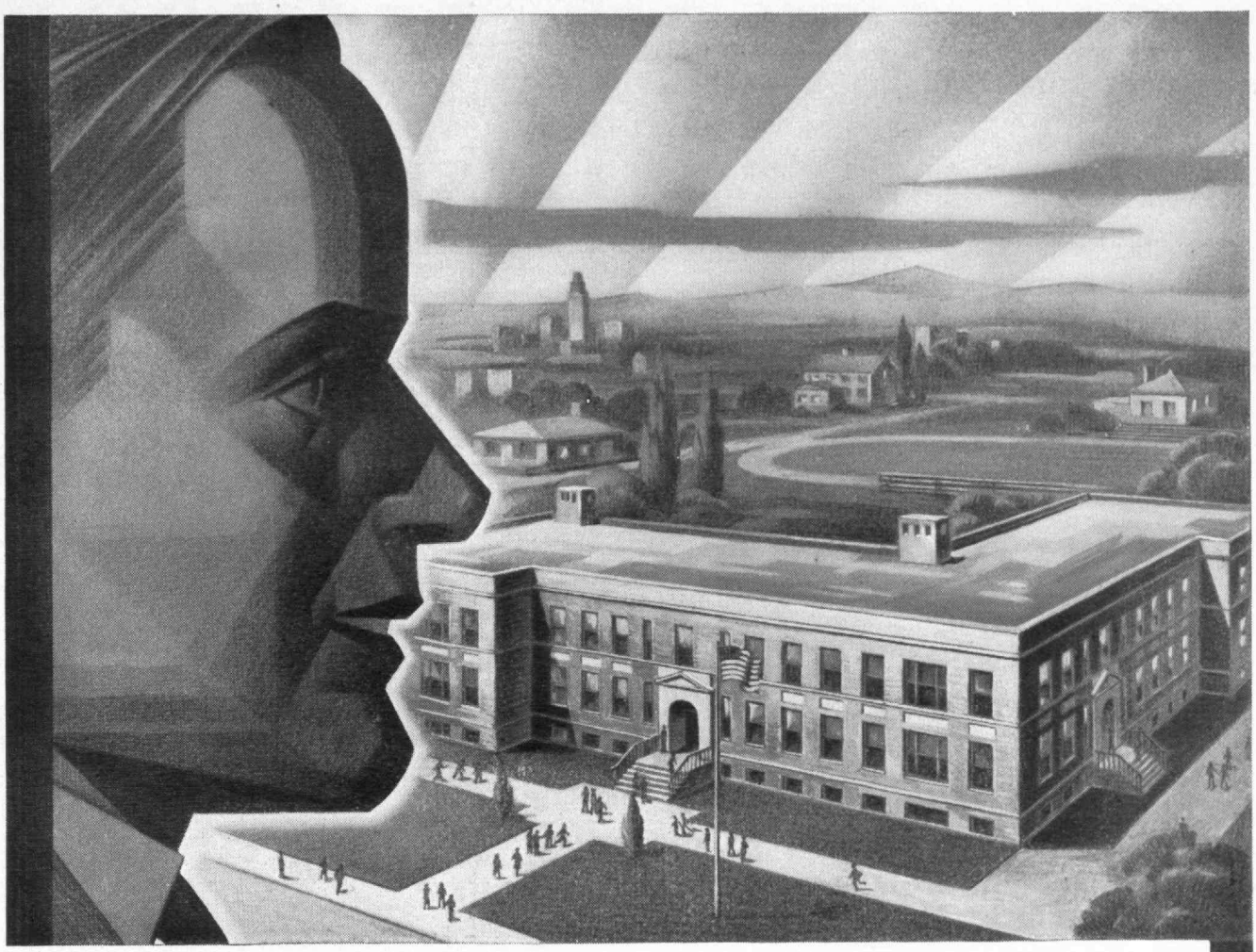
No—but the immense size of this 160,000-kilowatt turbine-generator dwarfs the 44 test men who test such apparatus. This turbine-generator for the Brooklyn Edison Company—the largest single-shaft unit yet developed—is capable of furnishing muscle power equal to all the inhabitants of New York City. Its 214,400 horsepower operates both day and night, lifting heavy burdens from human shoulders, and supplying electric energy to countless devices in homes, in offices, and in factories.

The 44 test men shown above represent 31 colleges and universities from New Mexico to New Hampshire, including the University of Porto Rico. Each year many college-trained men join the General Electric Testing Department, which trains them for future responsible positions and electrical leadership on land, on sea, and in the air.

95-895DH

GENERAL ELECTRIC

THE TECHNOLOGY REVIEW, May, 1932. Vol. XXXIV, No. 8. Published monthly from October to May Inclusive and in July at 10 Ferry Street, Concord, N. H. Publication date: twenty-seventh of the month preceding date of issue. Annual subscription $3.50; Canadian and Foreign subscription $4.00. Entered as second-class matter at the Post Office at Concord, N. H., under the Act of March 3, 1879.



The School — it had its slipping hazards. But now there's safety in Alundum Stair Tiles and Treads

EDUCATION « » « »

Norton also serving America's greatest industry — the fundamental industry — the school. "Norton Floors" is the trade name for a line of non-slip products — Alundum Stair and Floor Tiles, Alundum Ceramic Mosaics, Alundum Aggregates for terrazzo and cement floors.

All are permanently non-slip. Wear-resisting.

School children must be safeguarded against accident — on the stairs, in the lobbies, the lavatories, the shower room. Even the swimming pool needs its non-slip edges and surrounding floors. Norton Company, Worcester, Mass.

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Grinding Wheels . . . . Abrasives for Polishing
. . . . Abrasive Aggregate . . . . Floor and Stair Tile . . . .
Grinding and Lapping Machines . . . . Refractories
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MASSACHUSETTS
INSTITUTE TECHNOLOGY

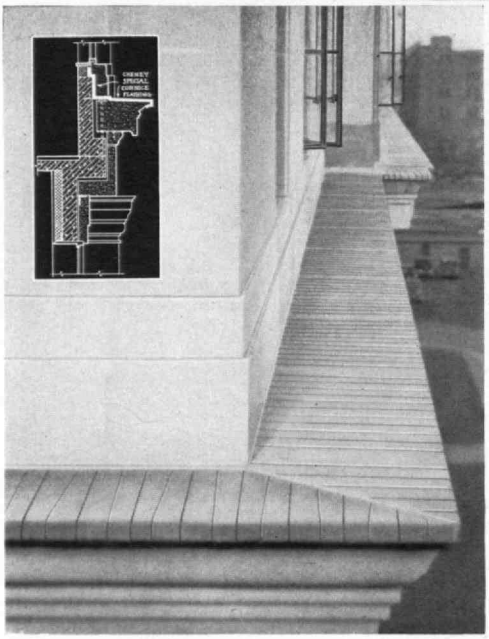
New George Eastman Research Laboratories, Cambridge, Massachusetts

Coolidge & Carlson, Architects

J. Farquhar's Sons, Inc., Sheet Metal Contractors

Stone & Webster, Inc., Contractors & Engineers

Below: Flashing on Main Cornice



CHENEY

THRU-WALL FLASHING PROVIDES SPECIAL CORNICE PROTECTION AGAINST SEEPAGE—EXPANSION AND CONTRACTION

The method of thru-flashing the main cornice of the new Massachusetts Institute of Technology Laboratories clearly demonstrates the use of Cheney Thru-wall Flashing formed to specification.

The photograph illustrates that part of the flashing exposed to the weather; the cross section, the usual thru-wall installation and method used in anchoring the flashing by carrying it across the top, down the face and underneath the cornice.

Cheney Keyed Flashing used as exposed cornice covering, absorbs expansion and contraction strains without breaking — whereas plain metal, constantly strained, invariably breaks open, causing leaks.

Cheney Flashing is the only proved thru-wall copper flashing that runs completely through the masonry wall and forms a positive Key-bond in all directions within the mortar bed. Catalog on request.

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DOES NOT BREAK THE BOND

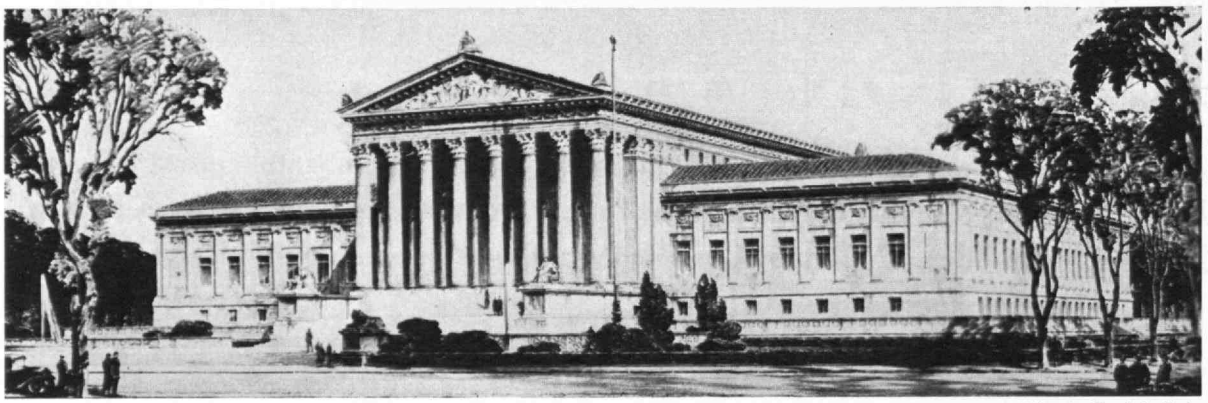

Photo by Harris & Ewing

THE United States Supreme Court is to have a building of its own — covering an entire block opposite the Senate Wing of the Capitol. This reproduction of the architect's rendering shows how the structure will look when completed. Already our quarries and shops are providing the material for the exterior walls — a contract which calls for the finishing of nearly 1000 carloads of Imperial Danby marble.

This latest addition to the nation's capital was designed by Cass Gilbert and his associates, Cass Gilbert, Jr., and John R. Rockart, in coöperation with David Lynn, Architect of the Capitol. It is 385 feet long and 304 feet wide. The sixteen columns at the entrance, made up of 80 huge drums, are about 52 feet high, with a maximum diameter of six feet.

In Washington, as in other sections of the country, the finest of architectural effects are being obtained through the use of Vermont Marble.

VERMONT MARBLE COMPANY PROCTOR, VERMONT

SCOVILL INGENUITY

did the Job

THE shell you see above demonstrates a unique production method developed by Scovill . . . a method that fulfilled unusual requirements in an economical way.

This was the problem presented to Scovill. The upper half of the shell required a wall thick enough to take a thread without weakening. For the lower half, a thinner wall gave ample strength. It would have been easy to provide the extra thickness of the upper half on the *outside* of the shell. But it was necessary that the outside diameter be uniform over its entire length.

Scovill worked out an ingenious method of manufacture that strengthened the upper half of the shell by providing the extra thickness on the *inside* only. The new method involved no increase in the total number of operations . . . and made a substantial saving for the customer by reducing the weight of metal in the shell. The quality and utility of the part were, of course, in no way sacrificed.

This economical solution of a difficult problem in metal working is typical of Scovill. The method developed in this and similar cases may be applied to other products and effect similar savings. Today, more than 3000 firms, relying on Scovill's technical knowledge, unusual facilities and 130 years' experience, regularly bring their manufacturing problems to this organization.

If you are interested in eliminating production difficulties, in improving your products and cutting costs wherever possible . . . why not put your case in the hands of Scovill? Write to the General Superintendent, in Waterbury, for full information.

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THE TABULAR VIEW

PROFESSOR TENNEY L. DAVIS sees science steadily and sees it whole, as his article, the first in this issue, demonstrates. After graduating from Technology in 1913 he continued his studies at Harvard where he received his Master's and Doctor's degrees. In 1919 he joined the Institute's instructing staff and since 1926 he has been an Associate Professor of Organic Chemistry. Besides being a Contributing Editor of The Review, he is an Associate Editor of both *Isis* and *Archeion*, journals relating to the history of science. ¶ When the names of 28 foremost American scientists were recently inscribed on stone tablets above the entrance of the new Buhl Hall of Science at the Pennsylvania College for Women, the roster included WILLIS R. WHITNEY, contributor of the second article in this issue. This is adequate evidence of Dr. Whitney's high standing, particularly because the 28 names were selected by a poll of the 902 starred scientists listed in "American Men of Science." Dr. Whitney obtained his Bachelor's degree from M. I. T. in 1890 and he is now Director of the Research Laboratory of the General Electric Company. The article by him is drawn from the address which he delivered upon receiving the Franklin Medal of the Franklin Institute.

IT IS particularly fitting that The Review should present a survey of the development of calculating machines, since so much notable work in this field has been carried on by the Institute's Department of Electrical Engineering. The author of this article, HAROLD L. HAZEN, '24, is an Assistant Professor of Electrical Engineering and he has participated in the development of the various integraphs and analyzers that have been built by his department. He just recently presented to the Faculty of the Institute a doctorial thesis entitled "The Extension of Electrical Engineering Analysis through the Reduction of Computational Limitations by Mechanical Methods." Mr. Hazen points out the inspiration that he and his colleagues have received from the works of that great German mathematician and philosopher, Leibniz. This doubtless recalls to Review readers an article by Norbert Wiener in our February, 1932, issue entitled "Back to Leibniz." ¶ DANIEL C. SAYRE contributed the article on the vulgate of aeronautics which appeared in The Review for November, 1931. Professor Sayre, as we have pointed out before, wants it expressly understood that he is not a *modock*, a *dodo*, or a *kewee*, but a full-fledged licensed pilot. This he has demonstrated by the great skill with which he has conducted the daily flights of the airplane operated by the Meteorological Division of the Institute's Department of Aeronautical Engineering. Throughout a New England winter he has accomplished 90% of the planned flights — a record to be envied, as transport pilots will agree. Professor Sayre holds both Bachelor's ('23) and Master's degrees from the Institute, and he is an Assistant Professor on the staff of the Institute's Department of Aeronautical Engineering.

Don't remove the moisture-proof wrapping from your package of Camels after you open it. The Camel Humidor Pack is protection against perfume and powder odors, dust and germs. In offices and homes, even in the dry atmosphere of artificial heat, the Camel Humidor Pack can be depended upon to deliver fresh Camels every time

She smokes FRESH cigarettes

. . . not parched or toasted

WHEN you buy Camels you get *fresh* cigarettes. That's why women particularly prefer them.

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The select tobaccos that go to make up your Camels are never parched or toasted.

The Reynolds method of scientifically applying heat guarantees against that.

If you've never experienced the delight of a cigarette that has never been parched or toasted switch to Camels, then leave them — if you can.

R. J. REYNOLDS TOBACCO COMPANY
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***Made* FRESH — *Kept* FRESH**

"Are you Listenin'?"
R. J. REYNOLDS TOBACCO COMPANY'S
COAST-TO-COAST RADIO PROGRAMS
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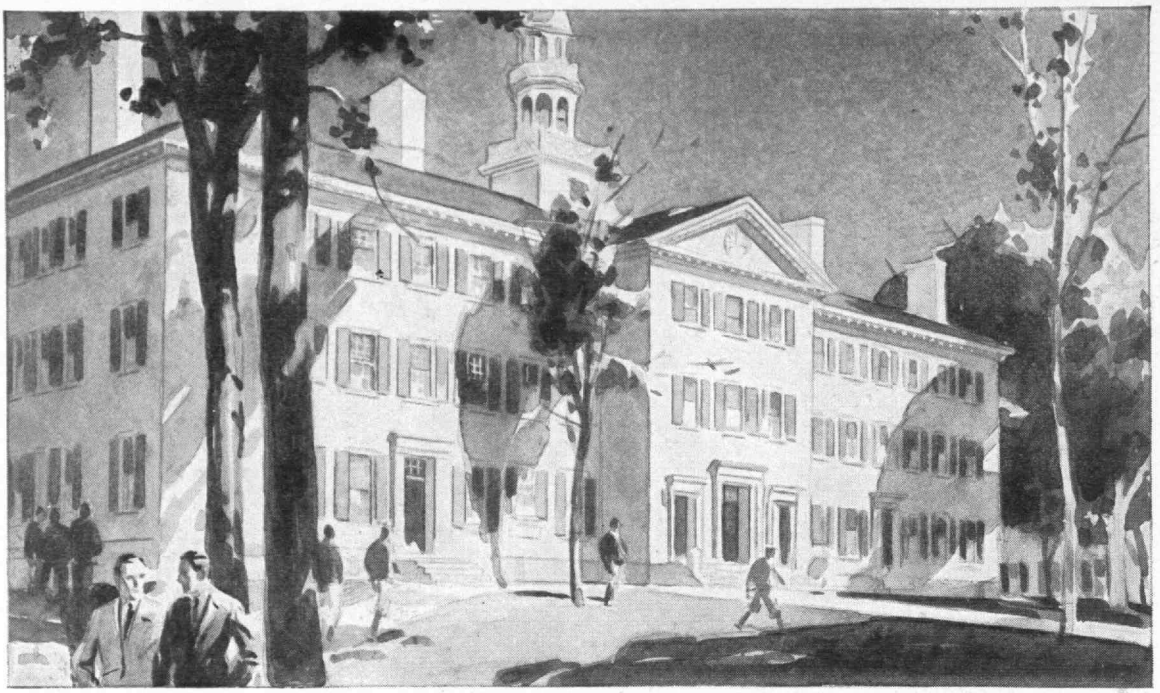
Columbia Broadcasting System
Prince Albert Quarter Hour
National Broadcasting Company Red Network
See radio page of local newspaper for time



Dartmouth Hall, in Old Dartmouth Row. This famous building once housed the entire college, including lecture rooms and dormitories.

DARTMOUTH ALUMNI OWN MORE BUICKS THAN ANY OTHER CAR OF *ANY* PRICE

In almost any representative group of people you may choose these days, you will find more owners of Buicks than of any other car in Buick's price range.

But consider the alumni of Dartmouth—or the readers of Dartmouth Alumni Magazine, at any rate. *In this group there are more owners of Buicks than of any other car of any price!*

According to figures from an impartial source*, 18 per cent of all readers of Dartmouth Alumni Magazine own Buicks. The car in second position—a car of lowest price—is owned by 16 per cent of this group of Dartmouth alumni; and the second car comparable to Buick in price is owned by eight per cent.

This preference for Buick among Dartmouth graduates is unusual only insofar as it gives Buick first place among *all* cars *regardless of price.* Alumni of fifteen leading universities throughout the United States own nearly twice as many Buicks as cars of the second make in Buick's field. And among all American motorists, college people and non-college people, the ratio of Buick owners to owners of the second car is equally impressive.

The excellence of design and manufacturing which has enabled Buick to win and hold this decisive leadership is nowhere more evident than in the new Buick Eight with Wizard Control. See and drive this car, and you will understand why Buick is an overwhelming favorite among thinking people everywhere. There are 26 models in a wide variety of body types. Prices range from $935 to $2055, f.o.b. Flint, Michigan.

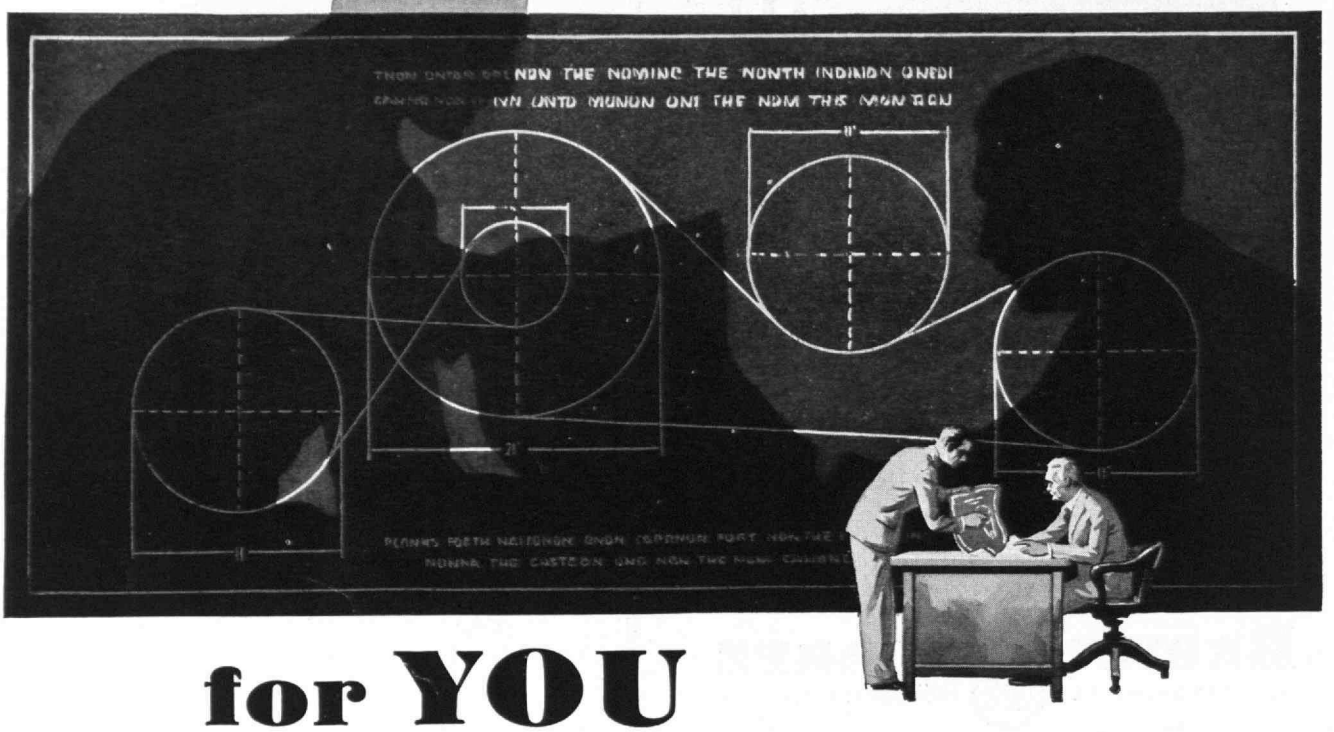
VALVE-IN-HEAD Buick MOTOR CARS

**Facts concerning ownership of Buicks among graduates of Dartmouth and other colleges and universities compiled by The Graduate Group of publications and by alumni associations.*

THE NEW BUICK *with* WIZARD CONTROL

WHEN BETTER AUTOMOBILES ARE BUILT, BUICK WILL BUILD THEM . . . PRODUCT OF GENERAL MOTORS WITH BODIES BY FISHER

A MAN with an IDEA



for YOU

He has brought money-making and money-saving ideas to owners and operators of many industrial plants all over the world, has the G. T. M. — Goodyear Technical Man.

His specialty is rubber, as applied to power transmission, conveying, elevating, bigger work, faster work, cleaner work in thousands of plants and scores of industries. He is an expert on rubber, with a practical knowledge of operating conditions in many industries.

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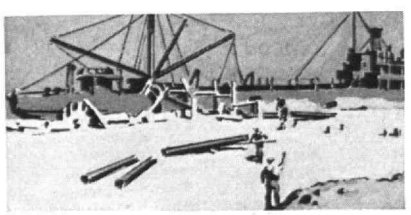
In the cases illustrated, and in many, many more, the G.T.M., functioning on the Goodyear Plant Analysis Plan, contributed a sound, scientific idea which meant money to the owner or operator.

Might he not do as much for you? Then why not get in touch with him? A line, or a call, to Goodyear, Akron, Ohio, or Los Angeles, California, will bring the G.T.M.

THE GREATEST NAME IN RUBBER

GOODYEAR

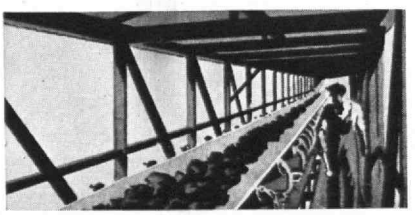
BELTS • MOLDED GOODS • HOSE • PACKING



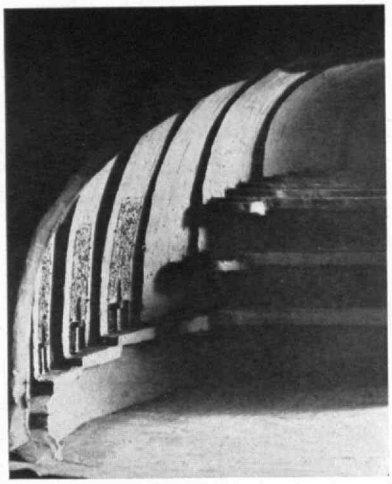
Goodyear Dredge Sleeves are factors in many successful dredging operations in all the waters of this continent. Being scientifically designed, constructed and specified for this duty, they give an excellent account of themselves wherever they are employed

TUNE IN:

Goodyear invites you to hear the Revellers Quartet, Goodyear Concert-Dance Orchestra and a feature guest artist every Wednesday night, over N. B. C. Red Network, WEAF and Associated Stations



The very largest coal conveying operations in this country are done on Goodyear Conveyor Belts. These belts, scientifically designed, constructed and applied to their work, have a record for outlasting others by as much as millions more tons carried and years more of service



Model of theater auditorium, Radio City. From a photographic study by Walter H. Kilham, Jr.

THE TECHNOLOGY REVIEW

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Edited at the Massachusetts Institute of Technology

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MIRACLES IN GLASS

Models of Microscopic Plant and Animal Life

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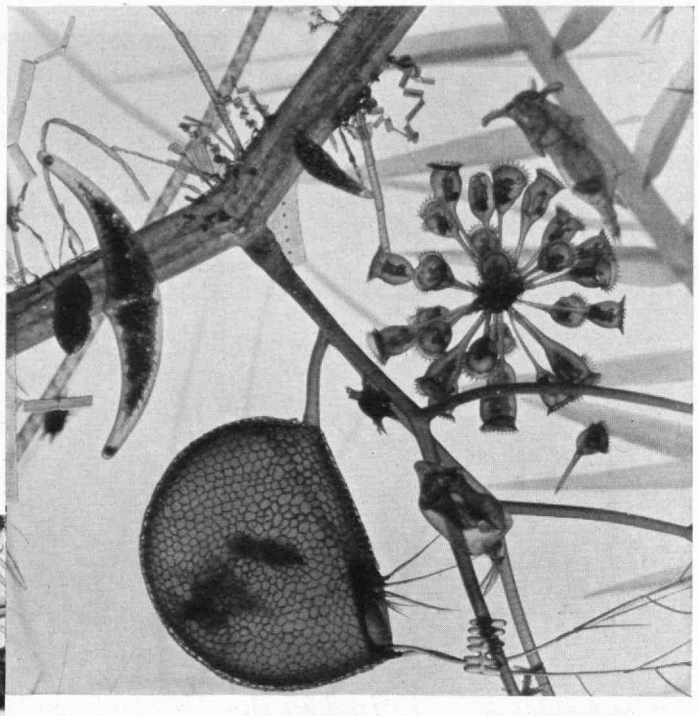
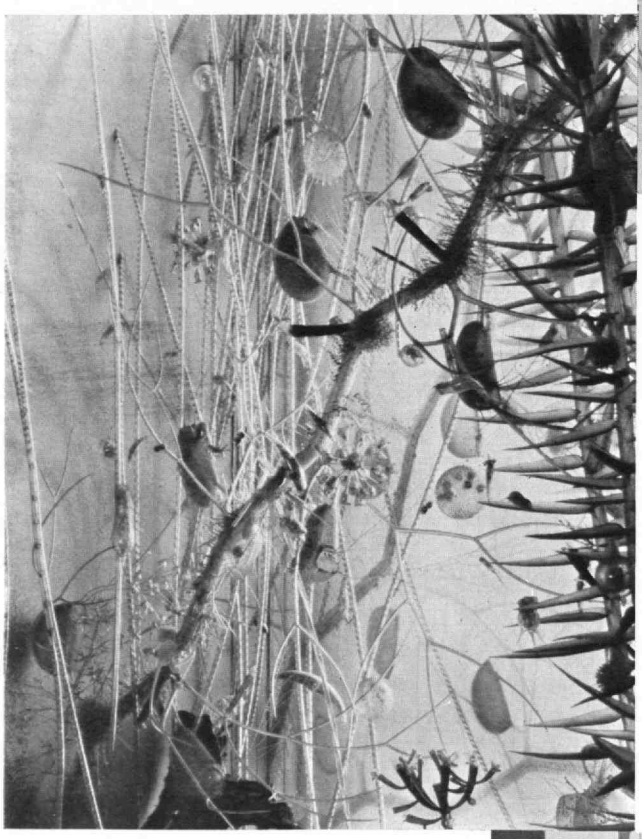
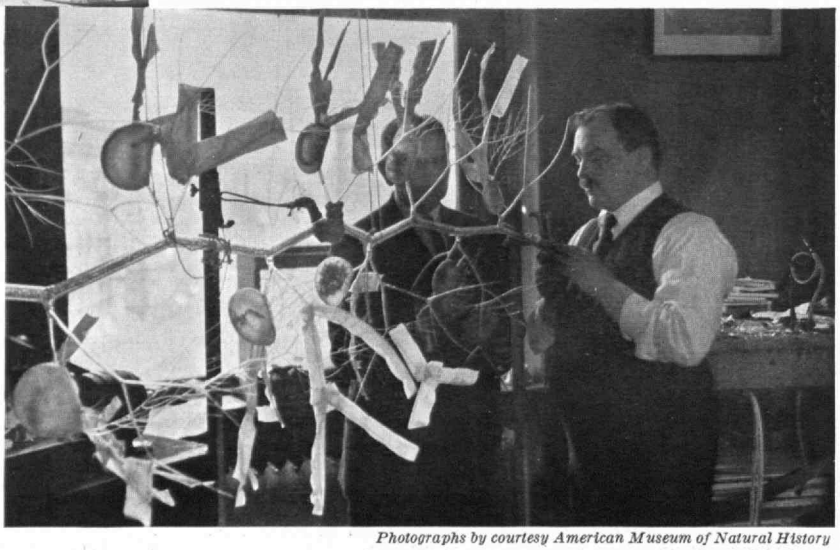




The adjacent illustrations show the minute inhabitants of one-half inch of pond-bottom as modeled in glass at the American Museum of Natural History. The general ensemble is known as a Rotifer Group, and the reproduction in glass represents a magnification of 100 diameters, or cubically, of one million. Rotifers are aquatic animals remarkable for the astonishing diversity of their forms and the vivacity and intelligence of their movements. The sac-like object in the lower left corner of the above illustration represents the bladderwort, a water plant that traps and devours rotifers. In the picture a captured rotifer is visible inside the bladderwort. The flower-like cluster above the sac is a group of rotifers.



At the left is shown Herman O. Mueller, "most skillful glass blower in the world" at work on the model of the Rotifer Group. He worked from sketches made from microscopic observations by other members of the staff of the Museum. His achievements in glass recall those of the Blaschka family in making Harvard's famous glass flowers.

Photographs by courtesy American Museum of Natural History

THE
TECHNOLOGY
REVIEW

Vol. 34, No. 8 May, 1932

SCIENCE AND THE PURPOSES OF LIFE

The Essential Business of Science

By Tenney L. Davis

"But the watchful grow uneasy, doubting the worth of the new violence." — Compton Leith in *Sirenica*.

"I WONDER," wrote George Gissing, "whether there are many men who have the same feeling with regard to 'science' as I have? It is something more than a prejudice; often it takes the form of a dread, almost a terror. Even those branches of science which are concerned with things that interest me — which deal with plants and animals and the heaven of stars — even these I cannot contemplate without uneasiness, a spiritual disaffection; new discoveries, new theories, however they engage my intelligence, soon weary me, and in some way depress. When it comes to other kinds of science — the sciences blatant and ubiquitous — the science by which men become millionaires — I am possessed with an angry hostility, a resentful apprehension. . . . I hate and fear 'science' because of my conviction that, for long to come if not for ever, it will be the remorseless enemy of mankind. I see it destroying all simplicity and gentleness of life, all the beauty of the world; I see it restoring barbarism under a mask of civilization; I see it darkening men's minds and hardening their hearts; I see it bringing a time of vast conflicts, which will pale into insignificance 'the thousand wars of old,' and, as likely as not, will whelm all the laborious advances of mankind in blood-drenched chaos.

"Yet to rail against it is as idle as to quarrel with any other force of nature. For myself, I can hold apart, and see as little as possible of the thing I deem accursed. But I think of some who are dear to me, whose life will be lived in the hard and fierce new age. . . . A new time of which only the perils are clearly visible is rushing upon us. Oh, the generous hopes and aspirations of forty years ago! Science, then, was seen as the deliverer; only a few could prophesy its tyranny, could foresee that it would revive old evils and trample on the promises of its beginning. This is the course of things; we must accept it. But it is some comfort to me that I — poor little mortal — have had no part in bringing the tyrant to his throne."

The charge against science is a weighty one; it is by no means new, and it is not at first sight unreasonable. Reasonable men have long and frequently repeated the accusation. Said the Preacher in the second or third century B.C., "Lo, this only have I found, that God hath made man upright; but they have sought out many inventions." Boerhaave lecturing to his classes at Leiden early in the eighteenth century commenced his discussion of the usefulness of chemistry in war by saying, "It were indeed to be wished that our art had been less ingenious in contriving means destructive to mankind; we mean those instruments of war which were unknown to the ancients and have made such havoc among the moderns. But as men have always been bent on seeking each other's destruction by continual wars; and as force, when brought against us, can only be repelled by force, the chief support of war must, after money, be now sought in chemistry." This will have a familiar sound to all who have read the newspapers during the years which have followed the Great War. There is nothing new in the idea that chemistry and the

other sciences are useful for war and for a variety of other purposes. Boerhaave continued, "Roger Bacon as early as the twelfth century had found out gunpowder, wherewith he imitated thunder and lightning, but that age was so happy as not to apply so extraordinary a discovery to the destruction of mankind." The lecturer concluded his account of this portion of his subject, "God grant that mortal men may not be so ingenious at their own cost as to pervert a profitable science any longer to such horrible uses. For this reason I forbear to mention several other matters far more horrible and destructive than any of those above rehearsed."

Each year adds weight to the already heavy indictment of science. The neighbor of George Gissing owned no blatant radio. News travels faster and more promptly from all parts of the world, but if that makes any difference the difference is that we are now more unhappy by thinking about the news, if we allow ourselves to think about it. Good news is not damaged by a little delay, but bad news loses something of its sting and malignancy. And, for all the promptness of our news, we are not much more skilful in preventing war, floods, famines, or pestilence in the Orient. "They also serve who only stand and wait" might have been written to describe the position of the medical scientists with reference to the "Spanish flu" epidemic of 1917–1919. The contagion would certainly not have had the prevalence which it did if modern methods of rapid transportation between distant places had been lacking. Smooth-running presses turn out newspapers in enormous numbers, but the papers contribute to the growing discontent. They are generally addressed to ten-year-old intelligences and are potent devices for the diffusion of propaganda. The smoke of industry shuts off from our cities a considerable part of the health-giving ultra-violet radiation of the sun. Automobiles are cheap and numerous, too numerous as every driver and as every pedestrian knows, but they help us to go more quickly to our work or to visit our friends. Friends do not live as near as they did in grandfather's day, and it is not practicable any more, in the cities at least, to walk to the homes of our friends in the sweet and silent fragrance of the evening. Mass production turns out many things of great convenience and utility. But some of the best psychologists are applying their science to the writing of advertisements which will cause the purchase of these things by people who neither want nor need them. Much present day advertising is designed viciously to produce a feeling of inferiority in the individual who lacks the article which is advertised. "Man committed his handicrafts to wheels and pistons; he steamed to his goal; he filled the earth with clangor, bandying his discords across ever vaster space, until no sound which held of music was likely to survive the unanswerable cacophony."

THESE are but a few of the charges which have been brought against science. There is a certain justice or appropriateness about them. The things which are charged have occurred and are occurring as everyone knows, and no one knows better than the man of science their number and their gravity. We do not seek to extenuate them. But we insist that they are not chargeable against science properly so-called. George Gissing knew it, for he made his accusation against "science" in quotation marks. Boerhaave knew it, for he spoke of perverting a profitable science to base uses. Science is decidedly one thing, and invention and industry are decidedly others. Applied science is manifold, as diversified as the activities of man, and like those activities it is chargeable with all the evil that man brings upon himself and with all the good as well. The evils which have followed from the applications of science have come about either with intent or without intent. If they have resulted from intent, the problem is one for the moralists. Let those who have misapplied science defend themselves. But we think that many of the evils have come about by accident and without deliberate intent, that is, that they have occurred because knowledge was lacking by which they might have been foreseen. They have therefore resulted from the circumstance that science has been applied without sufficient science in the application of it. We need more science for the application of science, and above all we need more science.

This is a strong argument for the usefulness of science, but we believe that there is a stronger one. We intend here to argue that science strictly so-called, applied to the purpose to which science and science alone is applicable, leads to the highest good that mortal man can get. As information is a necessary part of knowledge, so knowledge is a necessary part of wisdom.

Science is positive knowledge, knowledge of things both material and immaterial — of rocks, reagents, and wealth, of climates, states of mind, and modes of behavior, knowledge of things which exist as matter does and of things which do not exist like the ideal entities of mathematics. Inquisitive man from the beginning has collected information; inquiring man has sorted it, weighed it, interpreted it; retaining some as authentic, rejecting some as spurious, he has converted information into knowledge. The vast body of accumulated knowledge which constitutes science is unique among the possessions of man, for it has never ceased to grow and to improve. Our philosophy is no truer than the philosophy of the past, our sages and seers are no more astute, as George Sarton has pointed out, our art no more beautiful, and our literature no better. Our religious teachers are not more saintly than those who have gone before, our scientific men are not more intelligent, but our science is better because our knowledge of things is more extensive. Each year it grows. The time is long since past when one man could hope to master the whole of it.

The wealth which is science is available to every man who may choose to use it. The more there are who use it the more it grows, and this seems to be true regardless of the uses to which it is put. Some men like science for its own sake; they find pleasure in understanding what is. Some know the art of multiplying knowledge; they glory in the discovery of new truth. Others use science to "make the wheels go 'round." Among these are true lovers of machines who find in the motion of wheels and the buzz of mechanism the same ecstasy which chemists find in handsome crystals and physicists in charts for the graphical representation of their data. Among them there are others for whom the machines are secondary; science serves first to supply a means for the production

Reproduced by Durand

Albrecht Dürer's "Melencolia." Note the many objects relating to science, both pure and applied. Dürer maintained that painting and drawing are based fundamentally upon mathematics. Being a truly educated man, he was well versed in the science of his time, and prepared, in addition to his great works of art, books on Fortification, Mensuration, Fencing, Architecture, Music, and on the Proportions of the Horse and the Human Body

of dollars. Some, having had a taste of science in their school days, turn their backs upon it thereafter, but they use it when they know it not. Others, using science in their dealings with matters of every day, disregard it in the really important things of life and put their faith in superstition, hearsay, and authority. We need not here discuss the futility of such procedure. Yet the faithful are right in believing that science does not answer all the needs of man. Science does not evaluate. It offers no response to the questions, what are the great objectives of life? what is worth while? which way lies salvation? Each individual must find for himself his own objectives — or must accept them for himself when they are offered by religion or philosophy, but, once he has determined them, he cannot pursue them intelligently without a knowledge of things.

It seems unnecessary to labor the point that science is preëminently useful as a guide of conduct. It is unique in this respect, for nothing else will serve the same purpose. And the point also is not new, for Confucius set it down so clearly twenty-five hundred years ago that we cannot hope to improve his argument. We quote the text of Confucius, the first chapter of *The Great Learning* which is one of *The Four Books* of the Confucianists.

"What the Great Learning teaches, is — to illustrate illustrious virtue; to renovate the people; and to rest in the highest excellence.

"The point where to rest being known, the object of pursuit is then determined; and, that being determined, a calm unperturbedness may be attained. To that calmness there will succeed a tranquil repose. In that repose there may be careful deliberation, and that deliberation will be followed by the attainment *of the desired end.*

"Things have their roots and their branches. Affairs have their end and their beginning. To know what is first and what is last will lead near to what is taught *in the Great Learning.*

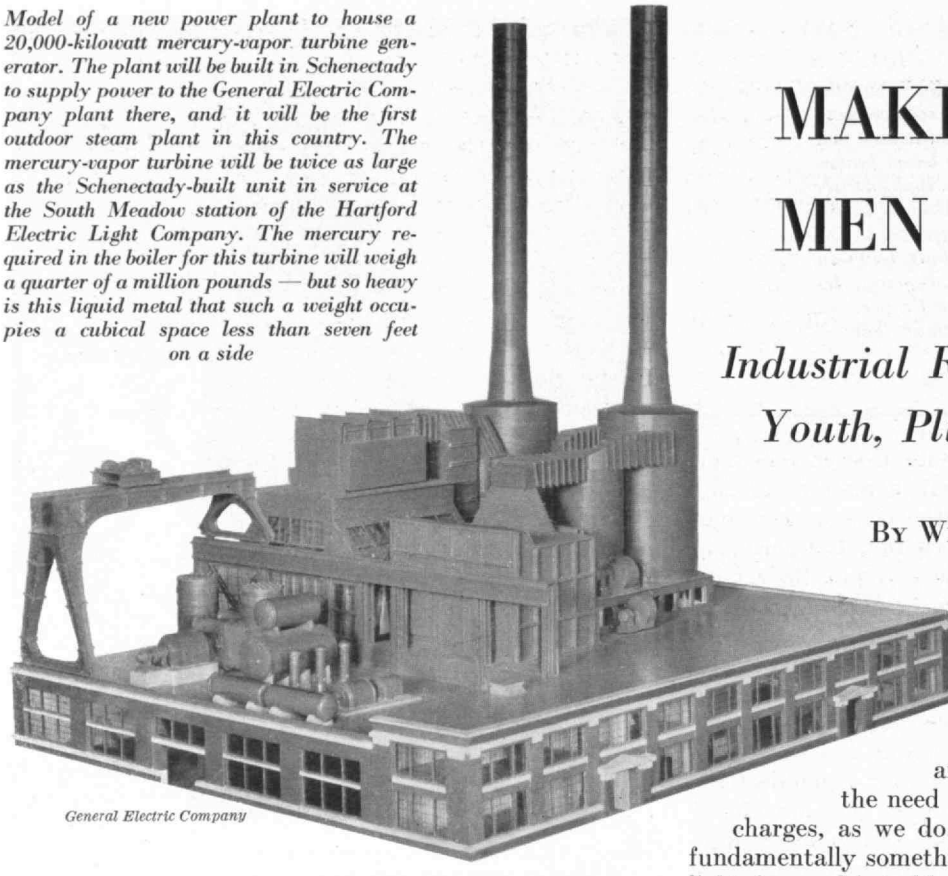
"The ancients who wished to illustrate illustrious virtue throughout the kingdom, first ordered well their own States. Wishing to order well their States, they first regulated their families. Wishing to regulate their families, they first cultivated their persons. Wishing to cultivate their persons, they first rectified their hearts. Wishing to rectify their hearts, they first sought to be sincere in their thoughts. Wishing to be sincere in their thoughts, they first extended to the utmost their knowledge. Such extension of knowledge lay in the investigation of things.

"Things being investigated, knowledge became complete. Their knowledge being complete, their thoughts were sincere. Their thoughts being sincere, their hearts were then rectified. Their hearts being rectified, their persons were cultivated. Their persons being cultivated, their families were regulated. Their families being regulated, their States were rightly governed. Their States being rightly governed, the whole kingdom was made tranquil and happy.

"From the Son of Heaven down to the mass of the people, all must consider the cultivation of the person the root of *everything besides.*

"It cannot be, when the root is neglected, that what should spring from it will be well ordered. It never has been the case that what was of great importance has been slightly cared for, and at the same time, that what was of slight importance has been greatly cared for."

The Confucianist religion does not concern itself with God, immortality, and the problems of metaphysics. It is highly practical, dealing with the life of man and with the problem of living that life as effectively as possible. It preaches the doctrine of the Superior Man, of the Mean, and of Naturalness. A follower of the religion may at the same time be a Taoist or a Buddhist, or, for that matter, he may be a Christian, and a better one for being a Confucianist. Since he must live his life in a natural environment, he must have a knowledge of natural things, among which of course his fellow man is not the least, and he must conduct his life according to this knowledge. Such a life will inevitably be sweet, for it will tend toward conformity with the purposes of the man who leads it. A knowing application of knowledge is great wisdom. Science is fundamental to the most important business of all, to the business of living.



General Electric Company

Model of a new power plant to house a 20,000-kilowatt mercury-vapor turbine generator. The plant will be built in Schenectady to supply power to the General Electric Company plant there, and it will be the first outdoor steam plant in this country. The mercury-vapor turbine will be twice as large as the Schenectady-built unit in service at the South Meadow station of the Hartford Electric Light Company. The mercury required in the boiler for this turbine will weigh a quarter of a million pounds — but so heavy is this liquid metal that such a weight occupies a cubical space less than seven feet on a side

MAKING VAIN MEN HUMBLE

Industrial Research — A Tip to Youth, Plus a Story for All

By Willis R. Whitney

THE younger a person is when anything is told him, the longer he may make use of it. If 70 were the age limit, it is at least five times as important to talk to a 20-year-old youth as to a man of 60, for the younger man has five times as long to use it. This makes the advantage in case of youth increase in direct proportion to the age difference. Moreover, the youth is in better condition to react to new information than his elders, because he is in close touch with other youth, with its receptivity to the new and novel, whether in science or in sports.

So I assume that the utility of addressing youth equals the square of the age-differential. But this is still not enough. As we grow older, we accumulate positive inhibitions, safety-first devices, delay mechanisms, inferiority complexes, and so on, and thus advantages vary as the third power or higher of the youthfulness.

My guiding thought then, in this paper, is to try to contribute from my experience to help those youths who aim at scientific or industrial research work. In doing this, I am emulating the example of Benjamin Franklin. By homely illustration from his practical experiences, he constantly gave wise guidance. Perhaps some youth, averse to pure theory or higher mathematics, possesses other qualities sufficient to insure success in constructive industry. Franklin would have said that he need not despair just because the theory of relativity is difficult, nor worry because favorite theories are killed one after another, providing he enjoys the excitement of the newly discovered phenomena themselves. There are wonderful realities enough for his span of life.

When Franklin experimented in electricity he had the same experiences which scientists meet today. He differentiated between interesting theory and valuable applications. He faced the problem of an electric "fluid," and early felt the need of positive and negative electric charges, as we do. He knew that electricity was fundamentally something or other, for he saw it in the lightning and in rubbed cats' fur. He never knew just exactly what it was, but he could still make practical applications of it. We are in the same state today. We shall not live long enough to know the essence of electricity.

The condition usually confronts those who seek comprehension of essences in general. But there is always an infinite amount of usefulness only thinly concealed in phenomena of nature. This is exposed by very simple efforts, even if the understanding of the essence itself be forever obscure. There is justification for almost any temporarily serviceable theory or hypothesis if it forces the experimenting hand, and that is the use of theory.

Franklin wrote: "In going on with these experiments, how many pretty systems do we build which we soon find ourselves obliged to destroy! If there is no other use discovered of electricity, this, however, is something considerable, that it may help to make vain man humble." When we consider how the theories of electricity have continued to scrape along the bottom of the oceans of useful electrical knowledge, we, too, may feel that electricity still makes vain man humble.

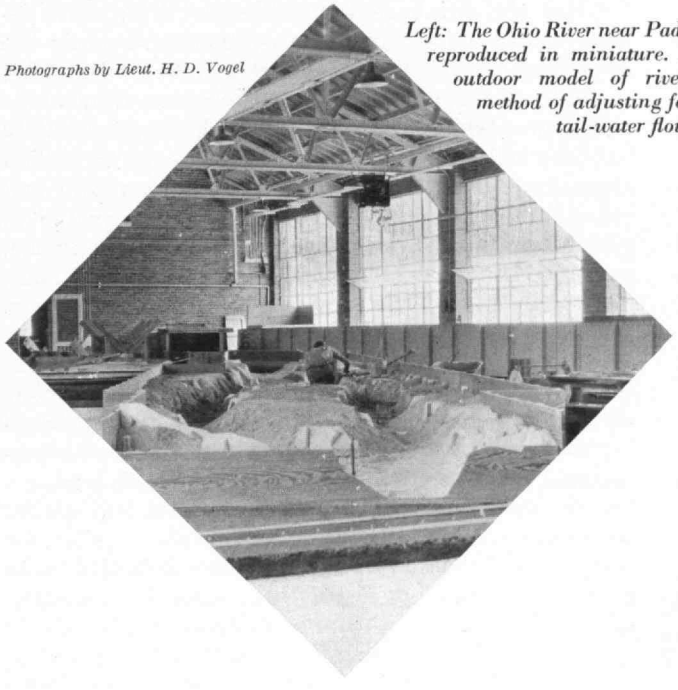
As a tool, electricity has improved practically every field of human endeavor except thinking. It works, listens, records, remembers, talks, but does not contemplate. There is, however, the bare possibility that our contemplation is itself some electro-biological process.

We have now passed from the one-fluid to the two-fluid theory, and broken down the positive and negative charges into proton and electron, but we do not know what they are. We merely know some of the things which they will do for us. After a century of seeking the essence, the picture of the thing we seek is but a

changing service, like a movie film. It is even now a concept of some of the recent investigators, like Dirac, that the ultimate electron is a dynamic stress, a state or thing, a polarized place, a sort of conceivable entity, but that the proton, being still less tangible, is some kind of vacancy in electronic orientation. This reminds us of Franklin's one-fluid theory, except that he pictured the positive as the excess and the negative as the vacancy.

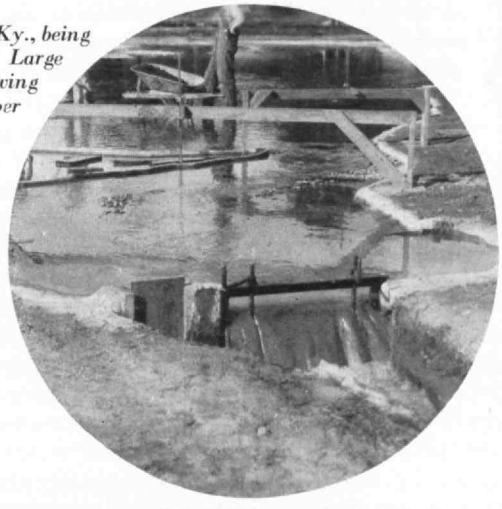
Although that kind of ultimate knowledge seems indefinitely postponed, there yet remain at least two good justifications for searching for it — the pleasure and the results. We are so constituted that we can emulate the Creator. Imagining what the machinery may be, as distinct from how it works, we conceive of a possible apparatus with wheels, and hard, round balls and waves of imaginary super-material. We are elated when we find that for a short period our creation seems to answer the limited requirements of our experience. With our new conception, which is frequently a misconception, we essay new creations. Often we produce something new and useful, but the new facts always finally force alterations of our crude, mechanical conceptions. In general, we are continually being forced just over the ragged edge of our powers of comprehension. I suppose this was as true when man decided how many gods of the wind there were as when the indivisable atom was thought to be the final thing in matter. In our day we have lost sight of the old atom in the marvelous galaxy of its moving electrons. We have enjoyed many useful results and great pleasure in the serviceable pictures we have drawn, and as the pictures go on changing, we get up new experiments to make use of the newly pictured things. The wave theory of the electron will certainly serve us well, but then it will point us to a next step. It is as though we were children to whom it is necessary to give a little egotism of self-expression in order to make us lift the light stone under which lies Nature's next secret.

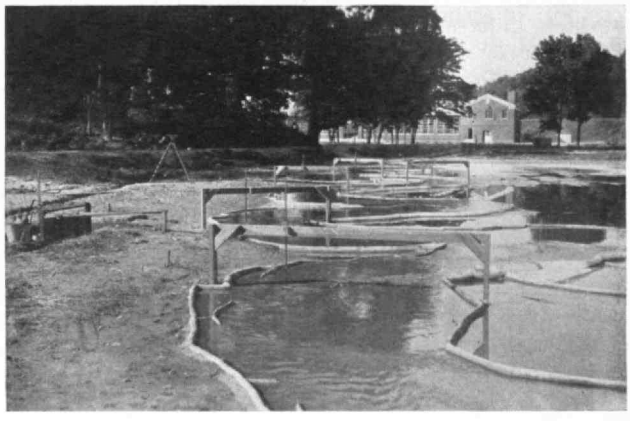
By our feeble efforts we continually uncover valuable new utilities amid the pleasures of intricate speculations, and so justify them. The fact that the dimensions of the physical universe increase so long as astronomers continue looking further is paralleled every time the light of new research is applied to the essence of anything. Gravity, matter, light, thought, and life still escape any ultimate analysis. But it is very characteristic and fortunate that the inquisitiveness which provides new hypotheses in reality forces research. This, in turn, discloses the new facts which, after they are uncovered, we know that we need. We are quite vain when we extrapolate much with our senses. There are whole areas of truth outside the limits of our present sensitivity which cannot be expressed in terms of old sense reflexes. Franklin said, "Nor is it of much importance to us to know the manner in which Nature executes her laws; 'tis enough if we know the laws themselves." He did not imply that knowing laws was all there is to it. Use and service were always in his mind. His kite ex-



Photographs by Lieut. H. D. Vogel

Left: The Ohio River near Paducah, Ky., being reproduced in miniature. Right: Large outdoor model of river showing method of adjusting for proper tail-water flow





Studying the rebellious Mississippi at the plant of the U. S. Waterways Experiment Station, Vicksburg, Miss. At the right is shown a miniature section of the Mississippi with the laboratory building in the background. This laboratory, the National Hydraulics Laboratory at Washington, and the one at M. I. T. are products of the current American renaissance in hydraulic engineering

periment led him directly to the application of the lightning rod, which is still the principal electrical, protective device.

It is not my desire to decry new theories — they are useful — but rather to help young men to see their value. If you will examine the theory of any one subject with relation to the time of its promulgation, you will see that that theory conforms to the knowledge and belief of the period. But (in the background) there is always the continuing effort for more complete understanding and utilization — what I like to call appreciation.

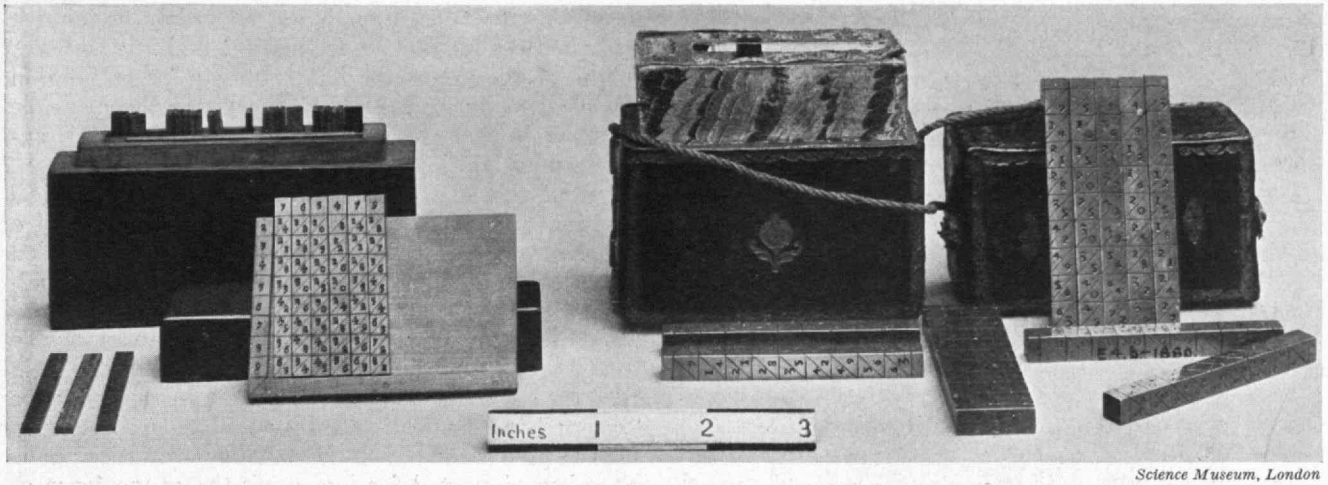
WITH youth particularly in mind and with reference to the application of science to industry, which is bound to be a growing field for young science students, I shall refer briefly to practical experiences or experiments of the kind which do not properly constitute scientific papers. Such things may form a pleasant part of applications of science to industrial research.

When the General Electric Company began electrical research, we called ourselves the first research laboratory in our industry. Admittedly others had done research and new engineering work, but we knew of no laboratory in industry where random scientific research was going on and where publication of results was incidentally an aim. Electricity offered a very expansive field. It seemed well to combine the studies of the pure science with its applications.

We first started to study scientifically electric light. Theoretically, it was then perhaps four per cent efficient. That is, if we could learn to transform electrical energy directly into the other vibrations of the so-called visible spectrum only, we might conserve 96% of our energy. While we went to work at once along the edges of the relevant known facts, we only did some of the obvious things, and so slowly raised the efficiency of the light. This was not so much by any new conception of what light really is as by relatively simple, but highly interesting and inquisitive observations. Fascinated by the spectral lines and light efficiency of mercury vapor, we attacked the various vapor lamps. New facts which we learned about the mercury arc made its application as an alternating current rectifier much more successful than as a luminous source. These devices have been used for years to supply direct current to the more modern flame arc lamp circuits, but their greatest recent contribution lies in electric railway work, and they are now taking active part in electrification of railways here and abroad. Thus we found Nature a leader easy to follow and difficult to drive. We usually wanted what she gave for our seeking, but we could seldom get exactly what we thought we wanted at the time. We wanted light. She gave us rectifiers.

While our major researches on light were under way, we attacked some apparently minor and simple problems in the porcelain plant. This work taught us, among other things, the importance of a research laboratory's acquiring the kinds of stored knowledge already in its local atmosphere, and adding to it, if possible, from other, modern fields. Someone wanted million-ohm porcelain resistances. Nowadays countless million-ohm resistances are part of standard radio equipments, but at that time they were new and useful for certain meters. All the information we obtained through our efforts on porcelain was very interesting. It later became useful, and, after 30 years, it is still active and being applied in new ways. We learned that arts and industries contain much knowledge not recognized within the confines of any one science.

Ceramics is one of the oldest industries and arts, but to the scientist it is a regular mine of new facts and tantalizing applications of modern physics and chemistry. Our megohm resistances were to be one inch long and a quarter inch in diameter. It was thought best to make them of the usual porcelain mixture impregnated with carbon. We were like kids playing with lampblack-clay mixtures. The infinite variability of this simple question has always attracted me. Generally speaking, porcelain is made up of four ingredients, each of which varies more or less: flint, feldspar, china clay, and ball clay, in about equal proportions. Each one of these exerts some effect on the final product. Here the scientist naturally rebels, because he dislikes mixtures of so many and such crude materials. The workmen usually added unmeasured water to this mixture, and, after letting it stand a while, partially and unevenly drying, determined when it was ready to be molded by merely pinching a handful. Scientists feel that the proper moisture should be added by exact weighing, and the mixture allowed to reach equable or complete distribution, perhaps by storage in a closed space. But, to return to our megohm resistances. We carefully mixed our carbon with the porcelain ingredients, but naturally felt that the shrinkage due to the final firing must depend greatly on the moisture content, and surely the resistance depended on the final shrinkage. But with such a complex mixture, first crudely pressed into rods and then submitted to irregular air drying, and finally to uncontrolled kiln firing, one could not expect a million ohms more than any other value between zero and infinity. We learned the ceramic arts, however, and greatly appreciated their important details. One by one, we refined these details, and, finally, by using small, electrically heated kilns for the firing, got our process under control. We could even change the final resistance at will by the relationship between time and temperature of the final firing. This gave us confidence, so that we later coöperated with the porcelain factory in producing so-called lightning arresters. These were also porcelain and graphite mixtures, large six-inch rods having a few hundred ohms resistance. Thousands had earlier been produced in the kiln, and were entirely useless, for they had resistances varying from thousands of ohms to a few units. But by applying the same laws we had already learned (the old facts of ceramics, figuratively speaking), we found that we could control the final resistance of the arresters within narrow limits if we could control time and temperature of firing. This control was entirely out of the question in coal-fired kilns, so we made tubular electric furnaces, fed mechanically by an accurately timed pusher. In this way, each rod passed through the identical electrical hot tube at a fixed rate, and they have been made this way now for a quarter century. All this came to my mind as illustrating the pleasure a research man (*Concluded on page 348*)



Science Museum, London

"Bones" or Calculating Rods invented by John Napier in 1617 to facilitate the multiplication and division of large numbers. The group on the left are set to illustrate the multiplication of the number 765479 by any other number

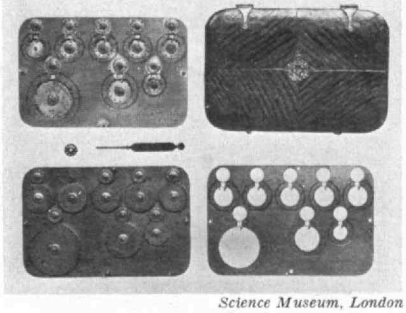
WORKING MATHEMATICS BY MACHINERY

The Ancients Used the Abacus and Napier Used His Bones, but Now Man Has New and Wonderful Machines To Do the Menial Work of Thinking

By Harold L. Hazen

IF ALL of present-day mechanical aids to computation were somehow suddenly abolished what would happen? Our business houses and corporations would be thrown into utter confusion by inability to keep accounts apace with transactions. Engineers would be helpless without slide rules and calculating machines. Statisticians and insurance companies would be powerless to analyze the myriads of cases now sorted and tabulated by machine. Our mariners would have adequate tidal data only at great cost and the calculation of ephemeris tables would be a formidable task indeed. The mathematician could develop numerical tables of new functions only with endless arithmetic. Such is the dependence of our activity upon mechanical calculators. They constitute a link as vital in our chain of interrelated activities as the telephone, or the electric light.

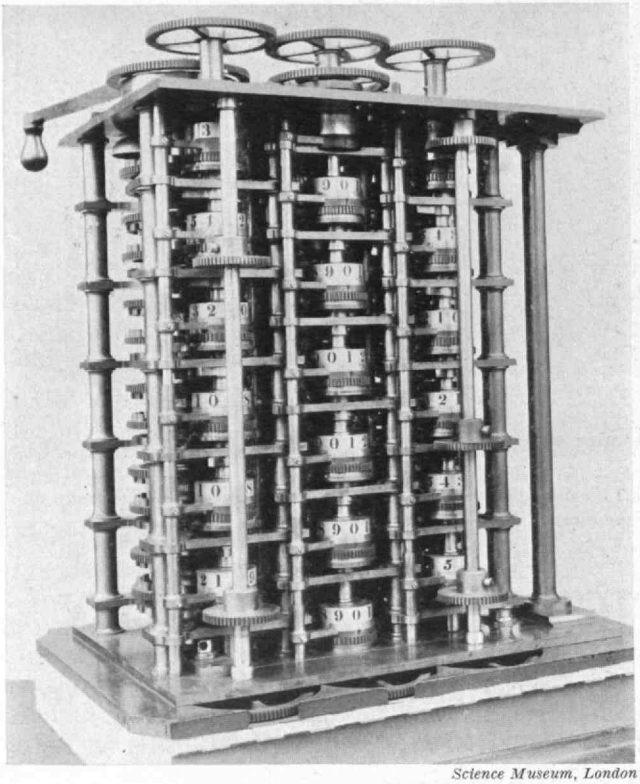
Such ready servants have not always been at man's call. Picture Henry Briggs, previous to 1624, in his first numerical development of that powerful boon to computors, common logarithms, calculating 54 successive square roots of ten, using some 30 decimal places and finishing with 17 or 18 significant figures, all by simple arithmetic. By the labor of this and several other similar calculations, the framework of the first set of common logarithms came into being. No less arduous was the interpolation of the body of the tables he completed. Today with much more powerful mathematical methods and a modern calculating machine Briggs would find his task much less forbidding.



Science Museum, London

Instrument invented by Samuel Moreland in 1666 for the addition and subtraction of pounds, shillings, pence, and farthings

To find the first calculating machines, however, it is necessary to go further into antiquity. The first mechanical computer on record is the abacus, which appears to have been known to the Greeks as early as the Seventh Century, and was probably obtained from the Indians. It survives to the present day, among oriental shopkeepers. To understand the probable cause of its origin, we must examine the methods of expressing number prior to the development of our present decimal cipher system, in which the various denominations (such as tenths, units, tens, and so on) are indicated by position. What apparently delayed development of this cipher notation was the lack of a symbol for zero which could be used to fill a blank file. With our present notation we experience no difficulty in expressing such a number as four hundred two and six hundredths as 402.06, but without zeros the indication of no tens or tenths would be very awkward. The abacus served to obviate this difficulty by keeping the counters representing various denominations on separate rods. Thus the abacus may be viewed as a mathematical tool arising from an inadequate notation, though the oriental peoples now use it, and in a quite scientific fashion, for the four elementary arithmetic processes as well as for extracting square and



Science Museum, London

A portion of Babbage's Difference Engine designed to calculate and print mathematical tables. Its construction was begun by the English government in 1823, but was suspended ten years later because of the enormous expense. At the time of its suspension about £17,000 had been expended

cube roots. After the present cipher system was introduced from the Arabs into western Europe in the Twelfth Century, the abacus became superfluous. It became obsolete there slowly, however, persisting until the Eighteenth Century.

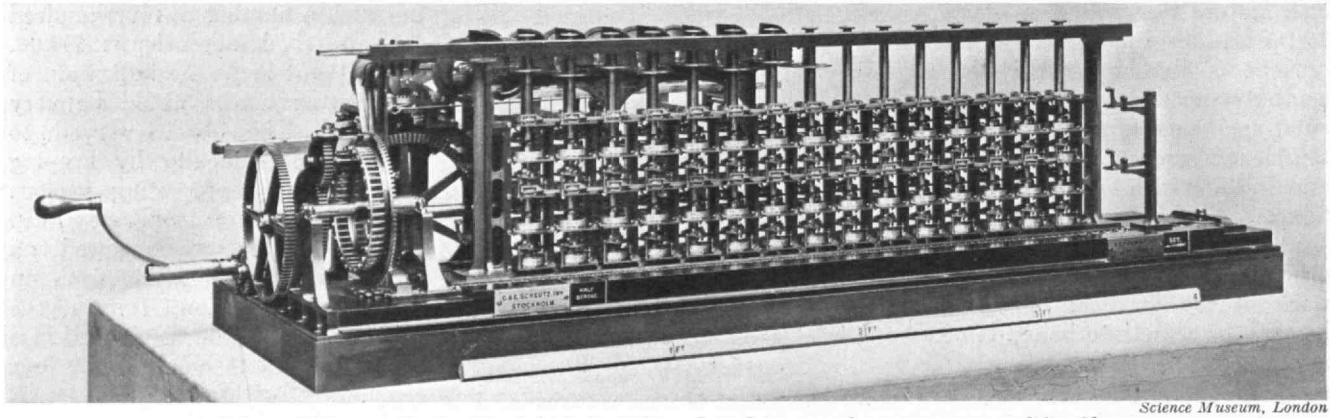
The next development in calculating devices was the work of John Napier, the English mathematician, who in 1617 published the first description of his famous "rods" or "bones." These rods are merely a sort of adjustable multiplication table and offer little attraction to one familiar with the multiplication table as far as 9×9. In Napier's time, however, these rods were hailed widely, both in England and on the continent, as a real contribution to the science of calculation and they were extensively used. Meanwhile Napier's contribution of logarithms in 1614, though not as widely acclaimed, laid the firm foundation for his just and lasting fame.

One of the most useful instruments for calculation follows directly from Napier's work, for the principle of the slide rule was conceived six years after his announcement of logarithms. Gunter, an Englishman, invented the idea of multiplication by the graphical addition of logarithms, and applied it by means of a single straight logarithmic scale on which he added distances by dividers. Wingate, in 1624, used two adjacent scales which were held together by hand and could be slidden relatively. The first rule with a movable slide apparently was made by one Robert Bissaker in 1654 for an unknown "T. W.," which needed only the "cursor" or "runner" added by William Robertson in 1775 to give it the present form. Many variations have since been invented for increasing the convenience or accuracy of the slide rule, and for adapting it to many special purposes; but the principle of all is essentially the same: that of obtaining a function of two variables as the sum of two functions, one of each of the variables. The addition of logarithmic functions to obtain the logarithm of a product is by far the most common form, though the same idea is applicable to square and reciprocal scales.

The slide rule seems to have enjoyed great popularity in England as early as 1700, but its use elsewhere was limited until about a century later. Many practical improvements, including the use of celluloid scales, have resulted in a very satisfactory instrument almost universally used among calculators.

WE TURN now from this first of the really useful mechanical aids to computation to another class of devices, usually called calculating machines, and typified at present by adding and multiplying machines. In general, these calculators operate with definite numbers and may, therefore, be classed as exact in contrast to the instruments using scales which may be classed as approximate. This distinction does not necessarily imply a corresponding distinction in accuracy, although it happens that the "exact" calculating machines are usually used where a large number of significant figures is wanted.

The first calculating machine worthy of the name was that of the French philosopher and mathematician, Blaise Pascal, who made what was apparently a



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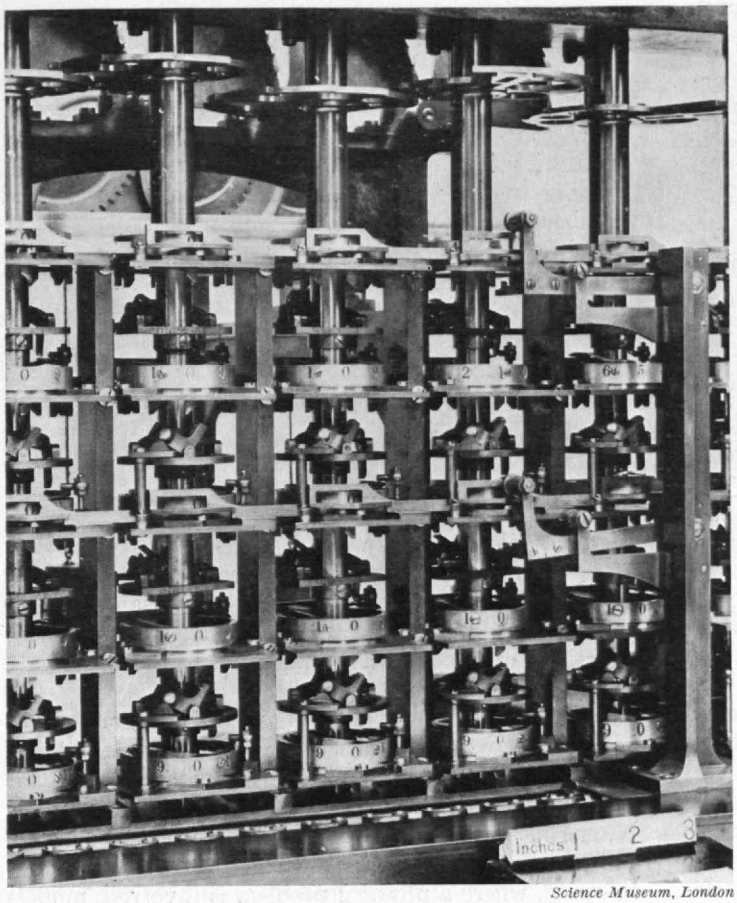
Scheutz Difference Engine No. 2, built in 1858 and used for several years to compute life tables



Science Museum, London

Mechanism details of the Scheutz Difference Engine No. 2. This engine, like Babbage's, consists of two distint parts, one for calculating and one for printing

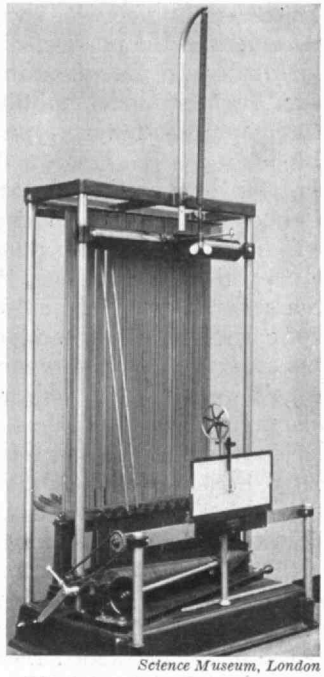
successful adding machine in 1642. This machine he built to aid in the accounting which fell upon his father as *Intendant* of Rouen. Judged by modern standards, Pascal's machines would be called very inefficient and slow. Nevertheless, a number of his specific ideas, especially those relating to carrying mechanisms, are those used today. Incidentally this problem of carrying a figure from one denomination to that next higher is one of the most critical in the design of such machines. This may be appreciated by noticing what must happen when the number one is added to the number 99,999,999. Any appreciable friction in the mechanism will result in a locked machine. Unfortunately, Pascal's enthusiasm overburdened his ailing body and he died when 39, having made some 50 models of calculating machines, besides contributing extensively to literature, mathematics, and physics.

The next important figure was Leibniz,[1] who not only showed great mechanical ingenuity in the design of calculating machines, but developed a philosophy of their relation to applied mathematics that inspires activity today. He pictured applied mathematics relieved of laborious mental routine by machines in the same way that man has been relieved of much physical labor by steam and electricity. In this broadness of concept he differed from many inventors of calculating machines who have had only one specific calculation in view. Unfortunately, the mechanicians available to Leibniz were incapable of carrying out his designs with sufficient accuracy, particularly in making gears, to produce a practical machine. Nevertheless, two of four basic types of mechanism now used for adding digits were described by Leibniz: *viz.*, the "stepped reckoner" and the gear with a variable number of teeth. The former was used in the first successful calculating machine manufactured on a commercial scale, the Thomas de Colmar Arithmometer, and in such later machines as the "Archimedes," "Unitas," and "Tate." The last named was put into useful form by F. S. Baldwin in 1875 and Odhner in 1891 and has since been used in a host of machines of which the "Brunsviga" and "Marchant" are examples. The "Monroe" uses a somewhat similar idea. Other adding mechanisms are the rocking segment of Burroughs (1880) and Felt (Comptometer, 1887), and the proportional rack motion of Charles Hamann used in the Mercedes-Euclid machine.[2] These various basic mechanisms have been adapted to numerous specialized uses such as accounting and billing. It is indicative of the mechanical genius of Leibniz that he should have originated ideas surviving into an age mechanical beyond his dreams.

All of the calculating machines mentioned thus far are essentially adding devices on which multiplication is performed by successive additions. The only significant mechanism for direct multiplication is that invented by Leon Bollée in 1887, when 18 years of age, to help his father, a bell founder, in the calculations incident to the design of large bells. It is now used in the "Millionaire." The essential element consists of a multiplication table expressed as the projection of pairs of pins above a datum plane.

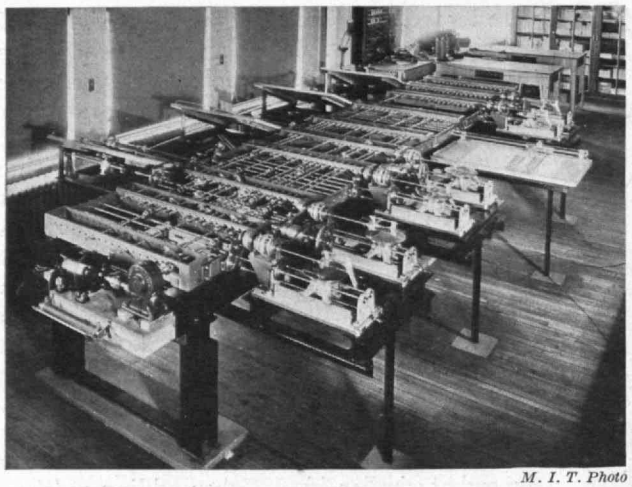
While attention here has been turned largely to the originators of basic mechanisms, it goes without saying that much of the perfection of modern machines is due to the ingenuity of many men, without which the basic ideas would have been but barren potentialities.

We may now enter a more strictly mathematical field, though one still within the realm of arithmetic devices, by considering so-called Difference and Analytical Engines. Here the



Science Museum, London

Michelson's and Stratton's (Samuel W. Stratton, late President of M. I. T. and Chairman of the Corporation) Product Integrator, used for harmonic analyses



M. I. T. Photo

Differential Analyzer built at M. I. T. under the direction of Vannevar Bush, D.Eng. '16, Vice-President and Dean of Engineering. This Analyzer is one of the most intricate machines ever constructed

name of Charles Babbage figures prominently, as he built the first Difference Engine in 1822, followed by a more ambitious program of construction carried on with the support of the British Government, but never completed. A Difference Engine is an elaborated adding machine which automatically builds up a numerical table of a function whose differences of a relatively small order are nearly enough constant over a reasonable range of the variable to be assumed constant for the purposes of calculation. Babbage's machine was designed not only to compute tables, but to prepare type for printing them. Although difficulties arose and this engine was never completed, George Scheutz and his son, Edward, after reading Babbage's work, designed a Difference Engine which was completed in 1853. Later it came into the possession of the Dudley Observatory in Albany, N. Y., where it remained until a few years ago. A second model, built in England in 1858, was used to compute and stereotype the English Life Tables of 1863.

After the cessation of work on his Difference Engine, Babbage set about to design an Analytical Engine which was to evaluate numerically any algebraic formula which involved only the four fundamental operations of arithmetic. This extremely ambitious project was not carried beyond the stage of preliminary design and the construction of a few models of working parts. Babbage's work became widely known, however, through his publications and those of others. An interesting incident is associated with the English translation of an early French article on this machine. The translator, who signed merely *A. L. L.*, supplied copious notes showing not only a thorough perception of the details of the machine, but a remarkable insight into its philosophy and underlying mathematical theory. The writer of the original article, intrigued by the style and content of the notes, persuaded Babbage to divulge the secret of the initials. They were those of Lady Ada Lovelace, the only daughter of Lord Byron!

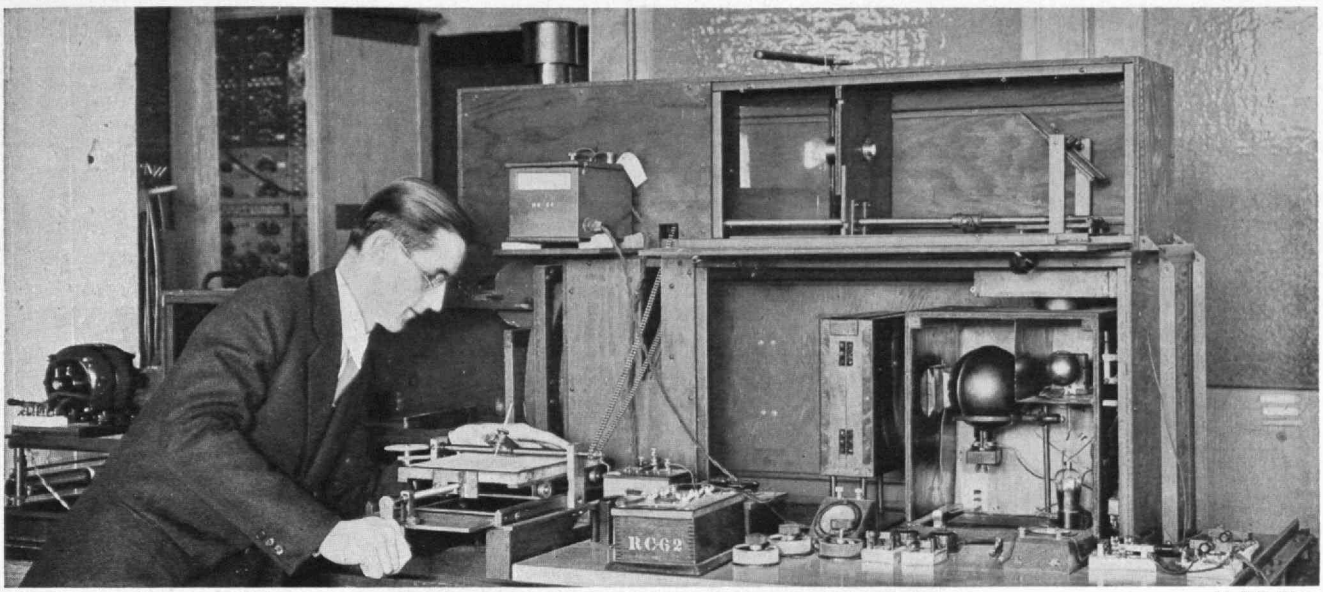
Babbage's engine was to be directed by two sets of Jacquard cards. One set was to interrelate the various parts of the machine so that it would perform a given sequence of arithmetical operations on those numerical variables indicated by means of the second set of cards. Though almost sublime in its concept, the combined effects of friction, backlash, and elasticity in so complicated a mechanism would impose tremendous practical difficulties in the way of its realization. Babbage's original plans provided for handling one thousand numbers of fifty figures each.[3]

Other Difference Engines have been designed and built, and at least one other comprehensive Analytical Engine, that of L. Torrés, designed. With the exception of the tables printed from plates made by the Scheutz's engines, their usefulness appears to have been small. It is difficult to say whether this is due to the fact that, though elegant, the method offers no great economic advantage, or to the fact that no one since the days of accurate and cheap production methods has given the subject careful study. The perfection of calculating machines coupled with well-planned schedules obviates, to a considerable degree, the need for automatic analytical machines dealing only with real variables. Were some effective device available for handling algebraic functions of a complex variable, the situation would probably be different.

Although Babbage's Analytical Engine would have been adapted to the solution of algebraic equations in a laborious way, attempts to design machines for this specific purpose have usually taken quite different form. Numerous interesting ideas have been proposed or tried, but without striking success in general. In specific cases, however, where a physical problem is involved, models or analogies may replace the need for the solution of algebraic equations as such, and in this sense the mechanical solution of algebraic equations is frequently quite successful. Examples are the models of indeterminate structures and small-scale electrical networks. A significant example of the latter is the alternating current M. I. T. Network Analyzer in the Electrical Engineering Research Laboratory. Its use in the solution of electric power network problems replaces the need for the solution of almost hopeless sets of equations.[4]

M. I. T. Photo

Dr. Bush (face forward) observing the working out of a mathematical problem on the Differential Analyzer shown above



M. I. T. Photo

M. I. T. Photo-Electric Integraph and its designer, Dr. Truman S. Gray, '28. *See page 345*

THUS far, attention has been confined to instruments and machines for use in arithmetical processes. The calculus is not without its computational problems, however. Since the calculus itself dates from the time of Newton and Leibniz, it is to be expected that integrating instruments, since integration in one connection or another lies at the bottom of most computational problems of the calculus, should have been developed somewhat later than arithmetical machines. Thus, though Pascal in 1642 and Leibniz in 1671 made primary inventions in the latter, it was not until 1814 that a Bavarian engineer, J. M. Hermann, invented an integrating device. A model as improved by his friend, Lämmle, was built in 1817 but, although this device was used in Bavaria, it is probable that subsequent developments were largely independent because Hermann's work was not published. In his device, a wheel, the total angular motion of which was a measure of the desired definite integral, was driven by a cone. The variable distance of the point of contact between wheel and cone from the vertex of the cone was made proportional to the integrand, which was integrated with respect to the angular travel of the cone about its axis. This arrangement permitted only positive values of the integrand.

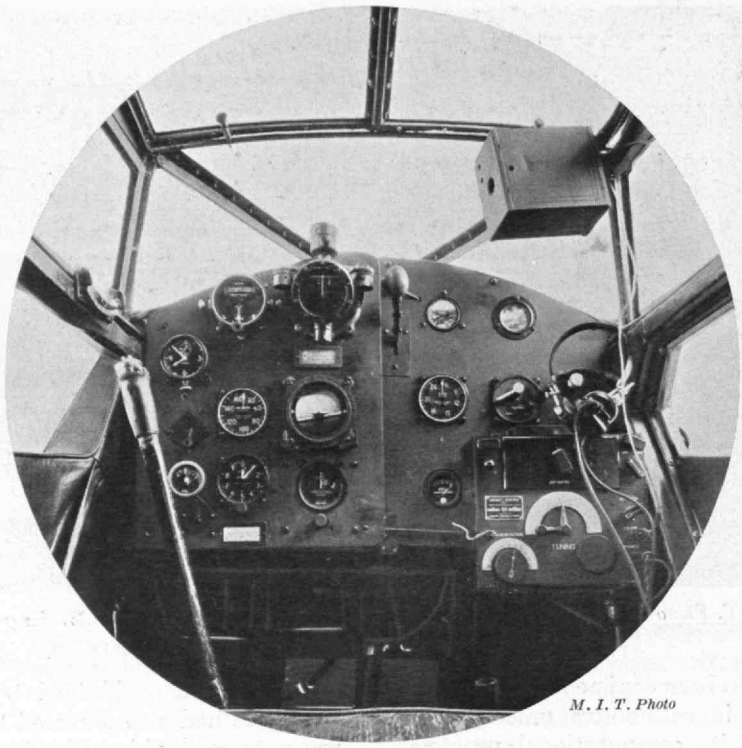
In 1824, Tito Gonella of Florence invented a similar device, but like Leibniz, a century and a half before, found the workmanship available to him inadequate to produce a satisfactory model. He tried without success to have a model made in Switzerland. A Swiss engineer, Oppikofer, probably influenced by Gonella's work, invented in 1826 and built in 1827 an integrator very similar to Gonella's. Some years later (1836), Oppikofer interested a Paris mechanician, Ernst, in his invention, with the result that an improved design became known in France associated with Ernst's name. It appears that subsequent development of integrators followed from Oppikofer's work rather than from the earlier work of Gonella and Hermane.[5]

Wetli, in 1849, discovered that by using a disk (a cone with a 180° angle at the vertex) negative as well as positive ordinates could be integrated in one operation. This idea had also occurred to Gonella previously but was not used by him. Wetli's wheel-and-disk integrator, as improved by an astronomer, Hansen of Seiberg, and built by Ausfeld, was an instrument of considerable precision and became widely used. For popular use, however, the familiar polar planimeter, invented by Jacob Amsler in 1854, while a student at Königsberg, soon supplanted the earlier types because of its simplicity, ruggedness, and low cost.

All of the integrators thus far mentioned have depended for their action upon a wheel accurately picking up from a surface on which it is moved only the tangential component of motion. James Clerk Maxwell, who became interested in integrating mechanisms during the Great Exposition of 1851, proposed an integrator which was actuated by supposedly pure rolling contact. James Thomson, Lord Kelvin's brother, built a disk-sphere-cylinder integrator utilizing this idea. A closer examination of the idea, taking into account the elasticity of materials, however, shows that pure rolling contact is never achieved, due to a finite area of contact between a sphere and disk, and that the reduction of this area of contact and the mechanical load imposed upon the driven member are much more significant factors than theoretical rolling contact.

Before leaving the subject of planimeters, *i.e.*, integrators for evaluating the area of a plane figure, the exceedingly simple "hatchet" planimeter invented by Captain Prytz[5] in 1887 should be mentioned. As it gives excellent results when used with discretion and can be improvised from a two-bladed pocket knife or other simple materials in a few minutes, it is an interesting tool. Strangely enough the underlying theory is much more complex than that of the more complicated instruments.

One special type of integrator has received much attention because of the importance of Fourier analysis in all studies of periodic phenomena. Such a device, called an harmonic analyzer, (*Continued on page 342*)



Instrument panel of the Cessna monoplane used by Technology's Meteorological Division in taking weather observations at an altitude of three miles above Boston. Every possible aid to navigation is used

The left side of the instrument board contains instruments of navigation, totalling in all, nine. The right side of the panel contains instruments for indicating the performance of the engine. The radio equipment may be seen at the bottom on the right

M. I. T. Photo

INTO THE FOOTHILLS OF THE ATMOSPHERE

Studying the Weather Three Miles Up with Technology's Flying Laboratory

By Daniel C. Sayre

"A SERIES of daily upper air soundings by airplane to determine the characteristics of North American air masses over Boston with the ultimate purpose of further extending the application of air mass and frontal analysis to American weather forecasting" — under some such formidable title labors the small monoplane known to the press as "Technology's Flying Laboratory." Since it is better known to the pilots of the airport as the "Flying Christmas Tree," due to the rather complex apparatus mounted on it and in it, one might say that a weighty title isn't all that it labors under.

The plane is scheduled for an ascent each morning at eight o'clock from the East Boston Airport to a height of 16,500 feet (its practical ceiling). Under each wing is carried a meteorograph, which automatically traces on a smoked drum records of the pressure, temperature, and relative humidity of each point in the flight. For scientific value, regularity of flight is very important. About 90% of the scheduled flights have been completed since the opening of the project on November 16 of last year, weather notwithstanding. Research will be continued until June 1 and will probably be renewed next fall. The results, so far, have been highly gratifying and apparently very much worth while.

It is a bit difficult for a meteorological layman to attempt to explain the exact significance of the research to an audience probably more lay on the subject. In the latter part of the Nineteenth Century there was developed both in America and Europe a system of weather forecasting based largely on telegraphic weather maps. This method stressed the areas of high and low barometric pressures, which in our latitudes, travel in general from west to east and bring with them various and sundry types of weather. During the years of the World War, a more fundamental theory was advanced and developed by a group of Scandinavian meteorologists which was based upon an analysis of the air masses which go to make up these areas of high and of low pressure. It was found that air masses of quite distinct sources and characteristics periodically appear over Europe. The behavior of these masses, especially along the boundaries between them where a warm mass will run up over cold air ahead of it or a cold mass will underrun preceding warm air, was found to furnish a very fruitful source of information which led in general to more accurate forecasts of weather developments. This system was almost immediately adopted in Germany and now is definitely established in one form or another in practically all European weather services.

M. I. T. Photo

What the pilot must watch under the left wing of the plane. Under the right wing is another meteorograph

In the United States application of this so-called Polar Front Theory has been much slower, partly because of the belief that American air masses, being predominantly continental in origin and route of travel, are difficult to analyze in contrast with the Atlantic or Polar Maritime types of air masses common over northwestern Europe. Proper identification of air masses depends very heavily on upper air observations of temperature and humidity distribution — a type of observation until recently not sufficiently extensive in this country. To remedy this situation the Weather Bureau has for a number of years maintained kite stations for upper air soundings at several points in the Middle West and during the last year has opened airplane stations in Dallas, Omaha, Chicago, and Cleveland. The results of this upper air work have already been much used by Professors C. G. A. Rossby and H. C. Willet of the Institute's Meteorological Division in the weather forecasts and weather analyses which they have carried on at the Institute for several years.

The Institute's station, therefore, fills an important gap in supplying upper air data for New England and is consequently a valuable supplement to the American system already existing. It differs, however, from the other stations in being devoted more to a program of purely scientific purpose and permanent results than to a mere contemporary aiding of day by day forecasts, although of course the basic information secured by the meteorographs is exchanged daily by wire with the Washington Weather Bureau. But this is incidental to the major purpose of determining the characteristics of air masses from the Pacific, the Gulf of Mexico, and the Canadian northwest as they pass over New England.

In contrast to the usual research project where the workers are faced with the single problem of developing and practicing a technique for handling apparatus in their laboratory, the problem which faced the Meteorological Division was a twofold one, for in addition to operating our research equipment, there was also the necessity for working up the technique and of manipulating the laboratory itself.

Fortunately for the success of Technology's meteorological work, the necessary research technique was available in the person of Dr. K. O. Lange who joined the Institute's staff in October, fresh from five years of aeronautical meteorological research at the Darmstadt Institute in Germany.

The technique of operating the plane, however, could not benefit in any great degree from experiences in Germany or elsewhere, partly due to radical dissimilarities of terrain, organization, and available equipment and partly because the limited performance of the plane required flights to be conducted by the pilot alone. I have said that the scientific value of the results is largely a function of the daily continuity of the flights. New England weather is not ideal flying weather. Air transport lines average about 75% of their scheduled flights during the winter months. To better this figure has required the utilization in the Institute's plane of, as far as I know, every possible navigation aid which would be practical under the circumstances, and the development of a quite extensive special flight technique.

There is no peace-time flying which approaches the heights we have reached save that necessary in making large scale photographic maps (done sometimes as high as 18,000 to 20,000 feet) and in operating one or two air lines over mountain passes in the Rockies, the Andes,

M. I. T. Photo

The horn-like appendages are Venturi tubes which drive the gyroscopic instruments. The pipe-like effect projecting forward from the wing is a Pitot tube connected with the air speed indicator

and the Alps. Of these the photographic flying is, of course, done only in the clearest and most cloudless weather. The average private or transport flyer rarely exceeds 6,000 feet in his flying.

THE airplane we have been using is a small Cessna cabin monoplane, powered with a Warner 120 h.p. engine. When the research began, it was necessary first to determine the plane ceiling and to study its rate of climb. With a full design load of four passengers and 50 gallons of gasoline, the plane can reach 12,000 feet in about two hours. With a single occupant and 20 gallons of gasoline, we have reached 19,000 feet in an hour and 30 minutes. Before the engine was shielded for radio, we were reaching our objective height of five kilometers (16,300 feet) in about 42 minutes. The climb and ceiling are obviously very sensitive to weight, and for this reason almost all the flights have been made by the pilot alone with the minimum safe limit of gasoline (20 gallons in clear weather, 30 when there is any prospect of cloud flying — the consumption in climb being about eight gallons an hour).

With the propeller set as it is for best climbing, the top speed in level flight is about 112 miles per hour, and the landing speed about 55.

Another early problem was that of finding an appropriate parachute. The standard parachute in common use is the ordinary seat type which forms a cushion about five inches thick under the pilot. The cabin, which is our laboratory, is so small that it is impossible to use one of these and still have head room. A back type parachute has, therefore, been obtained, and so far it has been quite satisfactory, although it is yet unproven. After all, the proof of the 'chute must await the bailing out therein.

Two other problems remain: one, of cold; the other, of oxygen. It is commonly known, of course, that the temperature and the density of the atmosphere decrease with altitude. The decrease of temperature, although never uniform, is on the average of about 3° F. for every thousand feet. The lowest temperature experienced by us this winter at the ceiling was about −35° F. This sounds rather formidable, but fortunately, it was a very dry cold and the plane, though unheated, is a closed one. Our early ideas of electrically-heated or fur-lined flying suits have consequently given way to a pair of woolen socks and ordinary overcoat, a pair of good mittens and a stocking cap. It is much better to be healthfully cold upstairs than to sweat around before and after the flight, and to be cramped up in a small place with an unnecessary amount of clothing.

Worry over oxygen also proved groundless. At approximately 17,000 feet, the density of the atmosphere is about half that at sea level. Probably, the oxygen line, *i. e.*, the level at which it is necessary to begin breathing oxygen from a tank, is in the neighborhood of 15,000 feet for any long period of stay. Our work above that limit, however, lasts less than thirty minutes, and since little exertion is necessary, the oxygen apparatus has remained on the ground.

One pilot flies the bulk of the flights with a relief pilot taking the Wednesday and Sunday turns. A flight is made every morning at 8:00 A.M. and about three extra flights a week are added to get further data on particularly interesting conditions.

Blind flying can be defined as an attempt to fly through a fog or cloud layer without sufficient instrumental aid. It is a common idea of landsmen that at least some pilots have a "bird sense," and that it is easy for anyone to tell whether he is right side up or not, but unfortunately, when a pilot is belted to the plane seat, and when he maneuvers in any way to bring centrifugal forces into action, his five unaided senses are quite inadequate.

Instrument flying may really be divided into two parts. That without, and that with, ice. The ordinary equipment in any civil airplane not in transport service includes a Pitot tube air speed indicator, an aneroid altimeter with a precision of 200 feet, a compass, and the engine instruments, such as the tachometer, oil pressure gauge, and oil temperature gauge. These, and a map are all that is needed for flying cross-country on a clear day. It is not possible to tell from these instruments, however, anything about the attitude of the plane in relation to the horizon. The ordinary compass is no very noble instrument, being used for little (*Continued on page 350*)

M. I. T. Photos

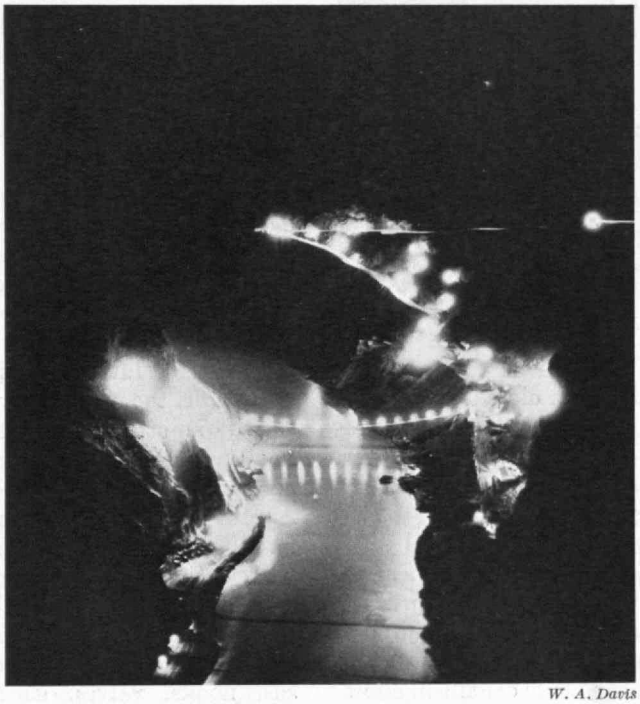
Above: The 120 h.p. Cessna monoplane described in the adjacent article. Left: Associate Professor C. G. A. Rossby, in charge of the Institute's work in Meteorology, Dr. K. O. Lange, Director of the Upper Air Research, and Assistant Professor Sayre, who does the piloting

THE TREND OF AFFAIRS

Bubble, Bubble, Toil and Trouble

For a charm of powerful trouble,
Like a hell-broth boil and bubble.
MACBETH: Act IV, Sc. 1

THAT tiny bubbles or cavities in a rapidly moving stream of water can erode and destroy the hardest metal would seem preposterous were it not an inescapable fact. With a water-hammer action that is quite impolosive in destructive power, these puny bubbles of air, gas, or vapor attack ship propellers, hydraulic turbine blades, and pump rotors, pocking and pitting them even to the point of destruction. In the inorganic realm of hydraulic machinery, these bubbles might be likened to smallpox microbes in the organic.



W. A. Davis

Black Canyon. The building of Hoover Dam proceeds by night as well as by day

Cavitation is the name which the hydraulic engineer has given to this mechanical disease and he is now searching for effective ways to prevent it. He knows that its incidence increased as the turbine pumps and propellers began to be operated at higher speeds. He knows certain tricks to mitigate its destructive effect. But he has yet to determine the etiology of cavitation or to understand thoroughly its action. Keen minds are converging on the problem and when its solution is found, a major difficulty in the operation of hydraulic machinery will have been conquered.

At the behest of the Safe Harbor Water Power Corporation (operators of the mammoth new Safe Harbor Hydroelectric Plant on the hard-working Susquehanna River) M. I. T. has begun an investigation of the physical, chemical, mechanical, and hydraulic conditions affecting cavitation. In charge of the Institute's research is famed Professor W. Spannhake, brought to Technology from the Technical University at Karlsruhe.

What is known of cavitation at present may be roughly described as follows. In a stream of water moving through turbines or by a ship propeller, the pressure at various points may differ greatly, being very high in some places and very low in others. In the areas of decreasing pressure a point is reached where the pressure is sufficiently low to result in the escape of air, gas, or vapor from the water to form bubbles. These areas of low pressure are almost always next to the wall of the channel through which the water is flowing.

After the bubbles are formed, they may be caught up and transported by the stream. If, in the course of this movement, they meet a region of higher pressure, they are compressed nearly instantaneously, and the ratio between the volume of the bubbles after compression and that before compression is so very great that tremendously high pressures are built up. Rather rough approximations have shown that this pressure may be as high as a thousand atmospheres (nearly 15,000 lbs. per square inch).

When compressed, the bubbles may become sufficiently small to enter crevices or clefts in the metal of the turbine or propellers. If in that position they collapse or implode, the metal as a result is subjected to a disintegrating pounding or hammering action. These enormous blows may not only erode; they may also bend turbine blades by lengthening the hammered side. With the collapse of the bubble may come also a high temperature which conspires with the mechanical hammering to both pound and melt the metal at once. This explains why metal affected by cavitation has the appearance of melted lava.

In the course of the formation and collapse of the bubbles, chemical, electrochemical, and other effects are at work to prepare, accompany, and complete the mechanical destruction. Such are the strange phenomena which occur in the witches' cauldron of hydraulic turbines.

The tests at M. I. T. are intended to give a foundation for the design of blades of turbines and pumps, with respect both to the danger of cavitation and to high

H. Armstrong Roberts

"They shall splash at a ten league canvas with brushes of comets' hair" — Kipling, "L'Envoi"

efficiency as well. For that purpose a closed circulation system has been constructed containing two pumps of 60 h.p. each, a closed tank of 150 cubic feet volume for quieting the flow, and a special test section arranged in the course of a pipe line bringing the water back to the pumps. At first, the phenomena will be studied in a simple Venturi canal where the cavitation will appear at about the smallest cross section. Later, this unit will be replaced by a rectangular canal in which there will be a single blade similar to an airplane profile. Glass plates covering both the Venturi and the blade canal will allow moving pictures to be taken. Pressures and temperatures will be carefully observed by ordinary piezometers and by special piezolectric and thermoelectric devices.

Spraying Metal

LAST month we described the development of veneers of metal which are applicable to a great variety of materials. Word now comes of the perfection of a device which will spray any one of a number of metallic coatings on wood, cloth, masonry, or another metal. The apparatus is called a metallizer and it will spray a coat of lead, zinc, bronze, aluminum, and other metals.

Receiving the metal to be sprayed in the form of wire, the metallizer melts and projects the liquid metal at a speed of 30,000 feet per minute. The sprayed metal forms a coating on the object which is claimed to be as permanent as a sheet of the same metal.

Already the method has been used effectively in several buildings, notably the Wilshire Professional Building in Los Angeles where elevator doors, mail boxes, and stair rails were sprayed with a nickel-silver coating. In other buildings aluminum has been sprayed.

It would be interesting to have a comparison of the cost of this method against that of the metal veneers mentioned above (see page 289 of the March issue). Certainly both types of treatment represent the growing adaptability of metal to a wide variety of uses.

Aluminum in Colors

ALUMINUM and its alloys, which in recent years have found a wide variety of uses (see The Review for March), are now being produced in attractive colors by a process similar to electroplating. The alumilite treatment, as this process is called, produces on the surface of the metal an oxide film which is highly resistant to corroding influences. This film has a strong affinity for certain organic and inorganic coloring compounds, which gives the metal a new field of usefulness.

Striking effects are produced by contrasts between the natural aluminum color and black, and other strong colors. It is also possible to produce the most delicate pastel shades when the film is formed on the proper aluminum alloys.

Because the film is formed by chemical and electrochemical reactions between the aluminum and the constituents of the electrolyte, the film is intimately a part of the metal and will not chip or flake off. Comparative tests show it to be more resistant to abrasion than chromium plate.

Although aluminum shingles have been available for some time, the natural silvery color of the metal was unsuited to most architectural demands. It is now possible, however, to produce these shingles in the color of slate and other shades required for architectural harmony. Another advantage claimed for colored aluminum in building is that it can be used for exterior decorative work without staining stone and other materials.

Articles which are now being produced in the natural alumilite finish are ice cube trays, moldings, fan blades, airplane propellers, wire, dairy equipment, baking utensils, hooks, valves, garden implements, file guides, pneumatic conveyer tubes, and fishing equipment.

The colored aluminite finish offers a wide variety of expression in the manufacture of buttons, bottle caps, name plates, toilet articles, beads, flashlight cases, gauge and clock dials, smoker's articles, switch plates, optical goods, motor housings, and cooking utensils. A machine has been developed for continuously coating and coloring coiled aluminum sheets, ribbon, and wire. Forming operations do not injure the finish.

The alumilite film offers some resistance to the passage of electrical currents. Laboratory tests have indicated that the film breaks down at a potential of 500 volts.

Fertilizer from Natural Gas

EVEN as the fixation of atmospheric nitrogen was of grave concern to all combatant nations between 1914 and 1918, so in the post-war peace period has it continued to engage a constantly increasing world-wide attention because of the insistence of far-sighted

agriculturists. Practically upon the outbreak of hostilities, the Central Powers found themselves cut off from the world's only natural nitrate deposits that could be worked profitably — those in Chile. It soon became evident, particularly in Germany, that the ammonia derived as a by-product from the distillation of coal to make coal gas and coke was insufficient to cope with the military demands for nitrogen compounds in explosives, to say nothing of the supply needed to provide enough manufactured fertilizer to ensure the intensified production of food.

How she, therefore, had recourse to the ammonia synthesis process developed by Drs. Fritz Haber and Carl Bosch is well known. Now in 1932 this Haber-Bosch process, in one or another of its variations, seems to be the principal survivor of the many attempts to fix atmospheric nitrogen. Within the past few months its *liaison* with the natural gas industry has come to pass and, if this attempt to combine the nitrogen of California's air with hydrogen from her natural gas to yield ammonia is a success, it is likely to result in further acclaim for the Haber-Bosch method.

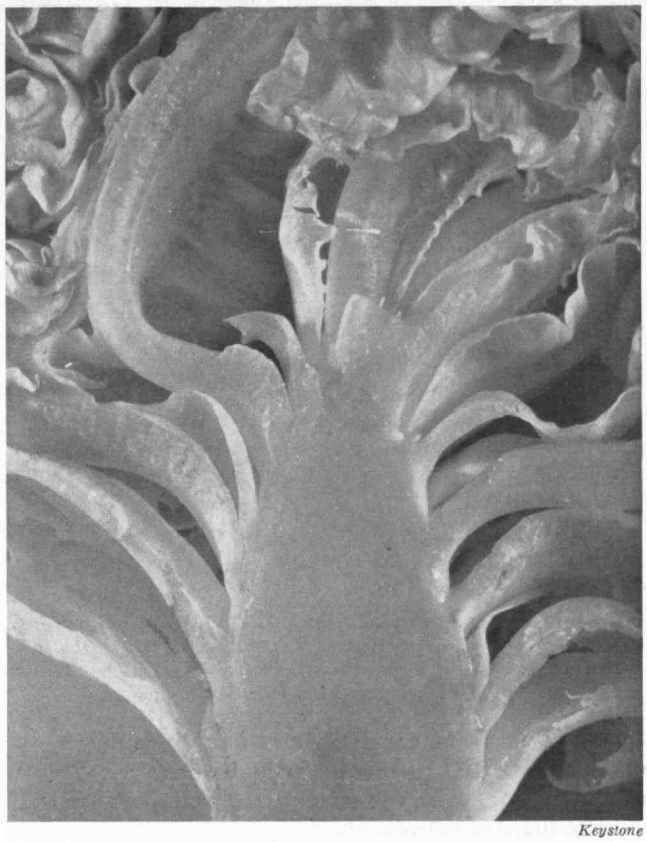
The world market for manufactured fertilizers grows apace. Although they were obtainable before the War, Germany's experience under war conditions, duplicated to a lesser degree by the Allies, has since 1918 made agriculturists inclined to ponder the blessings of having a cheap and reliable source of manufactured fertilizers, independent of tariff gyrations and the whimsies of Chilean politicos.

The encroachment of the machine age upon the farmer and his rising labor costs has weighed heavily. Already consumption is high in countries where agriculture is most intensive or, as was pointed out in another way recently by a writer in the *Petroleum World*, "it is evident that those countries whose agricultural land is most limited, use the largest amount of fertilizer." To support his statement he adduced data on the fertilizer consumption per acre in pounds of plant food for various countries. In the United States, which is at one extreme, it is 8; while in Holland, at the other extreme, it is 367, or 46 times as large. Italy's figure is nearly 3 times that of the United States, France's over 4 times, Japan's 7 times, and Germany's 9 times.

Hence, in the future outlook of the agriculturists, an unlimited source of nitrogen, literally a source as free as air, assumes extraordinary importance. For agriculture it must be combined with some other element, or *fixed*, and this is no easy matter for, when *free*, nitrogen's well-established characteristic is its chemical inertness. Besides the Haber-Bosch process, there are two other main methods of *fixing* atmospheric nitrogen:

(1) ELECTRIC ARC METHOD, yielding calcium nitrate. Air is passed through an electric arc, the small amounts of nitrogen oxides thus formed being dissolved in water to produce dilute nitric acid. Raw materials (air and water) are cheap and not much labor is required, but the Arc process needs a lot of electric power. The only large Arc plants ever built and operated over an appreciable period were in Norway.

(2) CYANAMIDE ($CaCN_2$). Calcium oxide and carbon are heated to high temperatures in an electric furnace, the resulting calcium carbide being then heated in a stream of nitrogen. Used first in Italy, the process now flourishes especially in Sweden and Switzerland where cheap water power is available. The largest cyanamide plant in the world, however, is that built during the War by the United States Government (but never operated) at Muscle Shoals, Ala. In 1917 not much was known outside of Germany about the Haber-Bosch process and the United States adopted the cyanamide process in preference to the Arc.



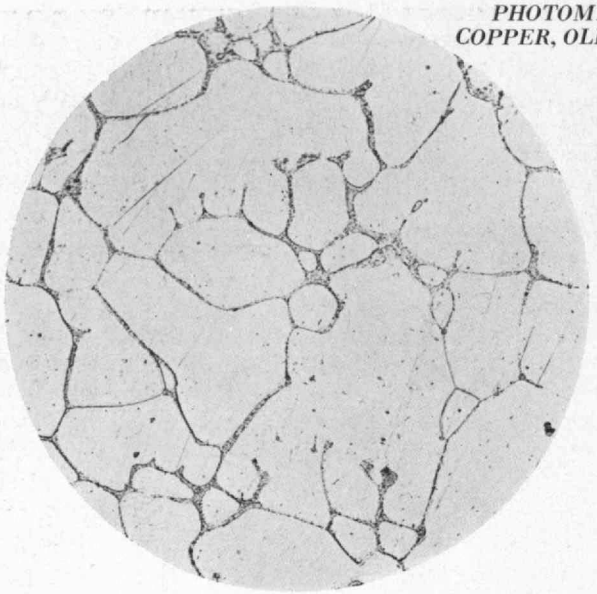
Keystone

Lettuce. "Human ingenuity can never devise anything more simple and more beautiful, or more to the purpose, than Nature does" — Leonardo da Vinci

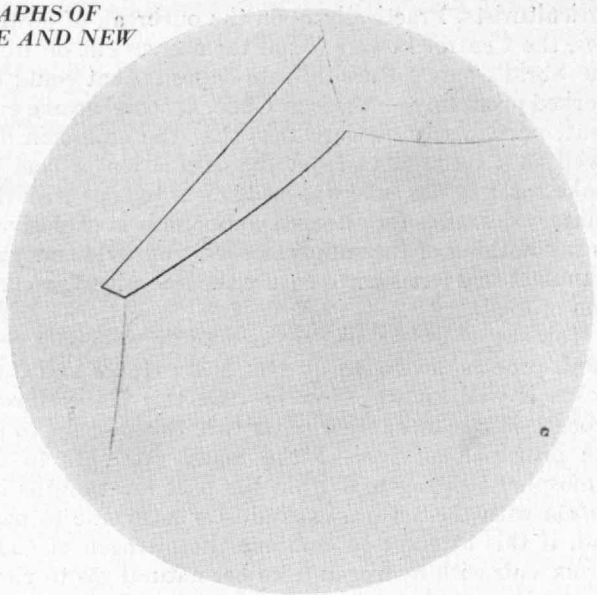
The Haber-Bosch, or Synthetic Ammonia Process, began operation just previous to the outbreak of the War in 1914 at a pilot plant built at Oppau by the *Badische Anilin-und Sodafabrik*. Soon afterward this pilot outfit was enlarged to gigantic dimensions and later another manufactory was built at Merseburg, with a capacity of about 200,000 tons of fixed nitrogen per year, or well over half the total annual shipment of Chilean nitrates. The principle of Drs. Haber and Bosch was as follows: If hydrogen and nitrogen be brought together under ordinary conditions of temperature and pressure, nothing much happens, but, if the temperature and pressure be raised, particularly in the presence of a catalyst, ammonia (NH_3) is formed. Ammonia is, of course, easily convertible into, among others, such an efficacious fertilizer as ammonium sulphate.

In the original Haber-Bosch process a temperature of around 500° C. and a pressure of 200 atmospheres was used with a variety of catalysts. Among the variations developed during and since the War are those of G. Claude (known for his neon lights) at temperatures of 500 to 600 degrees and 600 to 1,000 atmospheres; and

PHOTOMICROGRAPHS OF COPPER, OLD STYLE AND NEW



Ordinary refined copper. The dots around the grain boundaries are copper oxide. Their presence is the cause of failure under alternate stresses. When annealed in reducing gases, the oxide is reduced leaving the copper porous and weak



Oxygen-free copper. The absence of oxide along the grain boundaries explains the greater toughness and ductility of this material. No porosity or weakness results from annealing in reducing gases. See story below

the Mont-Cenis, a comparatively low pressure process operating at 100 atmospheres and a temperature of around 400 degrees. The catalysts are, for the most part, closely guarded secrets.

In any case, the installation of a synthetic ammonia plant calls for a sizable investment and the economics of its operation depend a good deal upon having at hand a cheap and dependable supply of hydrogen. For this reason the natural gas of California has entered the picture. At the new plant at Shell Point, Calif., there are two units having a capacity of 30 tons of fixed nitrogen a day. Here the input of natural gas is purified by a process of some complexity and put through a Linde gas-fractionation apparatus from which emerges a resultant which, after some impurities are scrubbed out, contains hydrogen and nitrogen only. By the rectification of air, a further supply of nitrogen is obtained and the ammonia synthesis is then carried out by the Mont-Cenis process.

A half-dozen years ago, natural gas meant little to the average American unless he came from Texas, Oklahoma, or the Appalachian regions producing it. Before 1932 is over, it is expected, however, that natural gas will be used for fuel in three-quarters of the states and, up to now, over two and a half billion dollars have been invested to care for the needs of some six million customers in nearly 100 of the larger cities. It is, therefore, a question whether, in building its ammonia synthesis plant using natural gas a source of hydrogen within 30 miles of San Francisco Bay, the Shell Petroleum Company has brought natural gas into the manufacture of fertilizer or whether the gas industry has taken its initial step towards absorbing the fertilizer business. Be that as it may, California has a growing population, her supply of water for agriculture is limited, her farmers are already educated to an intensive use of nitrogen fertilizers (as are those of nearby Hawaii), and she has plenty of natural gas.

Making Copper More Ductile

ONE of the most important recent developments in metallurgy is the production of oxygen-free copper, a form in which the metal, because of greatly increased ductility, reaches a new plane of usefulness for many purposes. The manufacture of oxygen-free copper on a commercial scale is due in a major degree to research conceived by and carried to a successful conclusion under the direction of Professor Carle R. Hayward, '04, of the M. I. T. Department of Mining and Metallurgy. His conviction, expressed several years ago, that copper of maximum purity would possess properties greatly superior to the tough-pitch metal produced by conventional methods, has been confirmed.

The high ductility of oxygen-free copper not only greatly increases the life of many products in which it is employed, but expedites manufacturing operations. In spinning and deep drawing, delays for annealing are virtually eliminated.

Oxygen-free copper was produced only after radical changes in methods of refining. The new process demands that no oxygen shall come in contact with the metal from the melting until it has become solid. The procedure provides for precise control of furnace and casting temperatures as well as casting speeds. The metal is produced in the form of wire bars, cakes, and billets, and is cast in vertical, water-cooled moulds. It is characterized by unusual smoothness of surface and freedom from defects, which in the older form of copper are the chief causes of fatigue failures. (See photomicrographs above.) The new copper also has the ability to withstand long exposure to reducing gases at high temperature, which permits bright annealing, that is, annealing without tarnishing the surface.

In addition to its new usefulness for various products formed by stamping and spinning, oxygen-free copper has distinct advantages in the electrical field. Its high

ductility enhances its value for all forms of wire, from heavy cables to ordinary household appliance cords. In the latter its resistance to constant flexing greatly prolongs the life of the conductor.

Humidity Detector

OF THE application of the photoelectric cell, there is no end; it is one of the most versatile contraptions ever developed by man. One of its latest uses is in an automatic humidity detector developed jointly by the B. F. Sturtevant Company and the General Electric Company.

A beam of light is directed through a window and into a photoelectric tube. When moisture forms on the window, this beam of light is obstructed and the sensitive photoelectric eye passes an impulse to a pliotron tube which, in turn, actuates a relay to shut off the humidifying system.

The detector is installed at a window preferably on the north side of the house. In actual installations the beam of light is reflected by mirrors back and forth through the window two or three times in order to make the equipment more sensitive. As soon as a certain amount of moisture condenses on the windowpane and thus obstructs the beam of light, the relay stops the motor driving the air conditioner. When the moisture clears the system responds and the motor starts again, and moisture is supplied to the room.

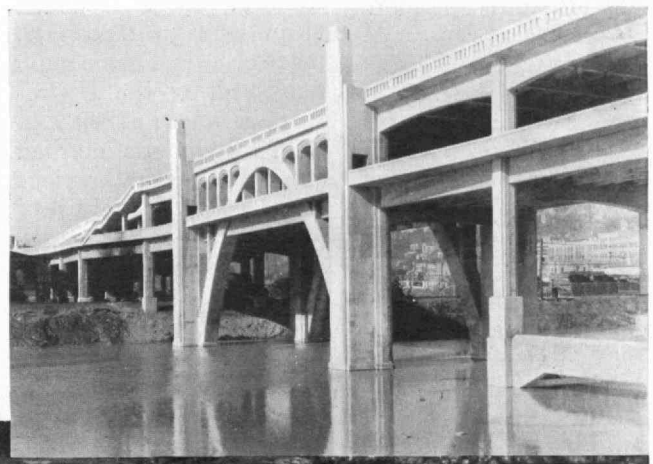
Automatic Gear Shifting

DESPITE the development of free wheeling, automatic clutching, and synchronous meshing, there yet remains much to be done to facilitate the transmission of power from an automobile engine to the wheels, front or back. The next major improvement will doubtless take the form of an automatically variable transmission which will not require any manual shifting. It is no secret that automotive engineers in this country are interested in such a development and that some of them forecast its early advent even in the low-price class.

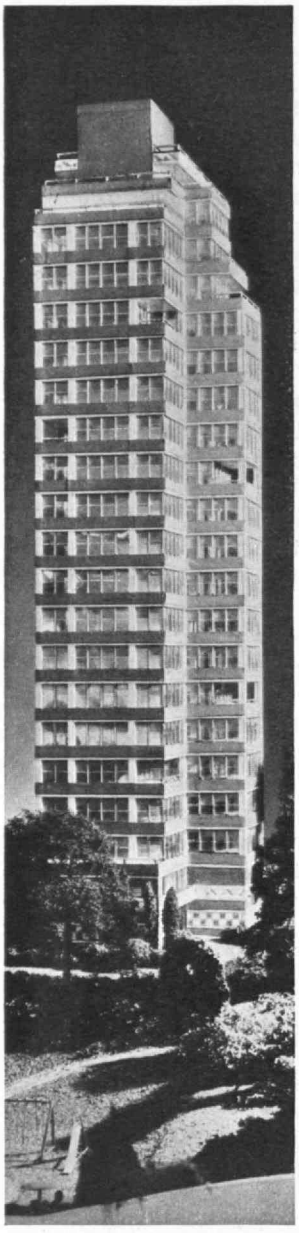
Already there are several systems designed to give automatically a ratio suitable to any driving condition. There is the epicyclic gear box which automatically gives a small number of gear ratios. There are also the so-called fluid fly-wheels designed to replace the conventional clutch and to give much more flexibility. In addition there are gears of the Constantinesco and Spontan type and many others, most of which are beyond the pale of good design.

The *Engineer* (London) in its issue of February 26 described another solution of the problem which has been evolved by H. F. Hobbs of Adelaide, Australia. His gear is automatic in operation providing a low gear ratio when resistance to the motion of the car is high and a direct drive when the car is being driven fast against light resistance. At all speeds it automatically adjusts the gear ratio to suit the relation between the resistance to motion and the power developed by the engine.

Sufficient knowledge about the performance of the device is not available to estimate its worth. Certainly if such a gear can be developed that is simple and dependable, it will evoke an enthusiastic response from motorists. If the shifting of gears could be dispensed with, the driving of an automobile would be reduced to a highly desirable simplicity. At the present time there is some feeling that the tendency has been to complicate driving; free wheeling certainly has not simplified it.



The new Western Hills Viaduct built by the Cincinnati Union Terminal Company of which Henry M. Waite, '90, is chief engineer. Below is a comprehensive view; to the right that portion of the Viaduct across Mill Creek



Project for an apartment tower in the country, designed by Raymond M. Hood, '03. The illustration is from a model exhibited in the International Exhibition of Modern Architecture, assembled by the Museum of Modern Art, New York

That the public does not always respond to added complications has been demonstrated by the lack of interest in a larger selection of gear ratios.

Snooping for Icebergs

IT IS now 20 years since the White Star Liner *Titanic* on her maiden voyage sank with a loss of 1,517 lives after collision with an iceberg near the "tail" of the Grand Banks. This memorable disaster of April 14–15, 1912, resulted in two scout cruisers of the United States Navy being sent to the ice zone to warn passing vessels of the limits of danger from day to day during the remainder of the 1912 ice season. Thus began international "services of derelict destruction, study, and observation of ice conditions, and ice patrol" in the North Atlantic, the necessity of which Admiral Hugh Rodman, then Ensign Rodman, made clear in a monograph published by the Hydrographic Office in 1890.

The Rodman study had cited that in the previous eight years a partial list of North Atlantic marine disasters due to ice included no less than 14 vessels which were lost and 40 which were seriously damaged, without taking into account many accidents to fishing and whaling ships. His study of the records up to 1890 clearly showed that the amount of ice coming down from the north and the distance it traveled southeastward of Newfoundland were not constant for any particular year or season. However, other than accumulating ice reports from shipmasters, no great advance was made in combating the menace until the loss of the *Titanic*, by which time radio had opportunely been developed. Otherwise the loss would have been even larger, and the effectiveness of the resulting ice patrol immeasurably lessened.

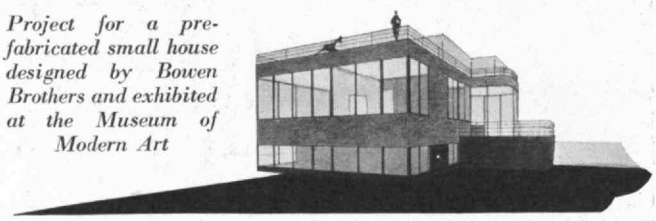
As it was, the two cruisers (*Chester* and *Birmingham*) detailed for service during May and June of 1912 demonstrated what could be done by the information they disseminated to ships in the danger zone and, in the following year, since no Navy ships were available, two revenue cutters (*Seneca* and *Miami*) were assigned to make alternate 15-day cruises during April, May, and June, using Halifax as a base. In 1913 the British government also coöperated by sending a ship to keep a watch off Newfoundland.

Upon the signing of the text of the Convention for the Safety of Life at Sea at London on January 20, 1914, the inauguration of the international ice patrol service on a continuing basis may be said to have taken place. The United States was invited to undertake its management, the expense to be defrayed by the high contracting parties in a fixed proportion: Great Britain 30%; France, Germany and the United States 15% apiece; and nine others, the remainder. While ratification of the Convention by the various signatory powers could not be accomplished without some delay, the United States Revenue Cutter Service immediately undertook the work. On January 28, 1915, the Revenue Cutter Service was, by Act of Congress, included in what was to be known as the Coast Guard Service, and (except in the War years of 1917 and 1918), the international observation and ice patrol service by the Coast Guard has been maintained. Since 1924, eleven nations have shared its cost, the following being the approximate percentage contribution of the four leaders: Great Britain 32, United States 21, France 16, and Germany 10.

The main steamship lanes of the "Atlantic Ferry" are the areas on which the ice patrol concentrates and, since these are well south of the usual limits of field ice, its particular concern is berg ice from the Greenland ice cap. These massive solid chunks often drift with the currents well into the lower latitudes before melting away, although an example such as occurred in 1928 is rare. This champion berg of four seasons ago was observed about a thousand miles off the American coast and reached the latitude of Washington before it disappeared.

In an average season — from January to September — something under 400 bergs are to be expected south of the 48th parallel. In an abnormal year such as 1929, however, more than that number were counted during May alone while, during the three heaviest months — April, May, and June — 1,168 were observed. Conditions were slightly sub-normal in 1930 and last season not an iceberg that would prove dangerous to shipping was seen on the Grand Banks. Early reports from cutters on the 1932 patrol are that the present year will not be sub-normal.

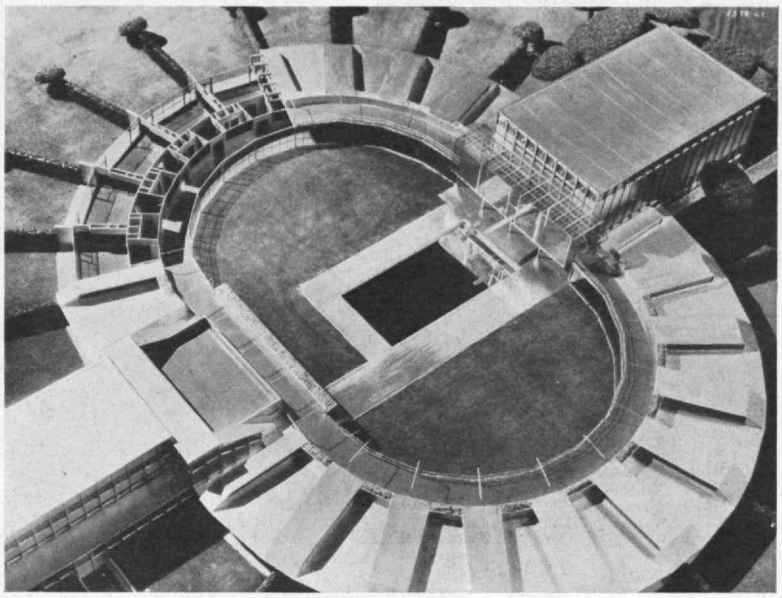
Contrary to popular impression, the Coast Guard does not make a practice of attempting to destroy icebergs, although some demolition experiments with gun fire, T.N.T., and by thermite charges (a method advocated by Professor H. T. Barnes of McGill Uni-



Project for a prefabricated small house designed by Bowen Brothers and exhibited at the Museum of Modern Art

versity) have been tried. The accumulated observations of the patrol show that only the toughest bergs along the northern edge of the Gulf Stream can outlast a fortnight. The patrol's ordinary functions are those of observation and reporting hazards to mariners. Once a critical berg is spotted, its probable drift track is charted, its actual movements kept account of, its stages of melting away and final disappearance progressively noted.

Supplementary to its immediate task, the Coast Guard cutters carry out much scientific work such as studies of the Labrador Current and Gulf Stream and deep-sea soundings for the improvement of existing charts. They also serve as vantage points for representatives of other governmental agencies such as the Bureau of Fisheries and the Weather Bureau. But the main justification of the ice patrol lies in the fact that, despite the prevalence of fog and bad weather on the Banks, not a single life has been lost by collision with icebergs or ice fields in the North Atlantic since the *Titanic* sank.



Model for a ring plan school by Richard J. Neutra exhibited by the Museum of Modern Art

Sweet Mortar

LAST November, by way of rendering autumnal homage to Clio, we presented some historical facts and fancies about the mortar used in ancient times. In the course of that excursion into the byways of history, we noted a legend that some of the wonderfully hard Roman mortar was made with wine instead of water and that even white sugar and other saccharine substances were additional ingredients. By way of rendering spring homage to Clio and even to Thalia, we now present a codicil to that legend.

It seems that there is a genuine reason why sugar was used by the Romans — if it was used. In a paper presented before the Sugar Division of the American Chemical Society at its meeting in New Orleans, Drs. Gerald J. Cox and John Metschl of the Mellon Institute of Industrial Research reported that they had demonstrated the value of "sweetening" lime-sand mortar.

From their experiments they have ascertained that mortar which contains cane sugar equal to 6% of the quick-lime content has a tensile strength 60% greater than that of mortar containing no sugar.

The process of mixing the sugar with the mortar is quite simple. The sugar is dissolved in part of the gaging water and mixed in with the sand and lime. The sugar must not be mixed with the lime before slaking. With the present price of sugar, the five or six pounds of sugar necessary for 100 pounds of lime is only a small addition to the cost of laying bricks or plastering a wall.

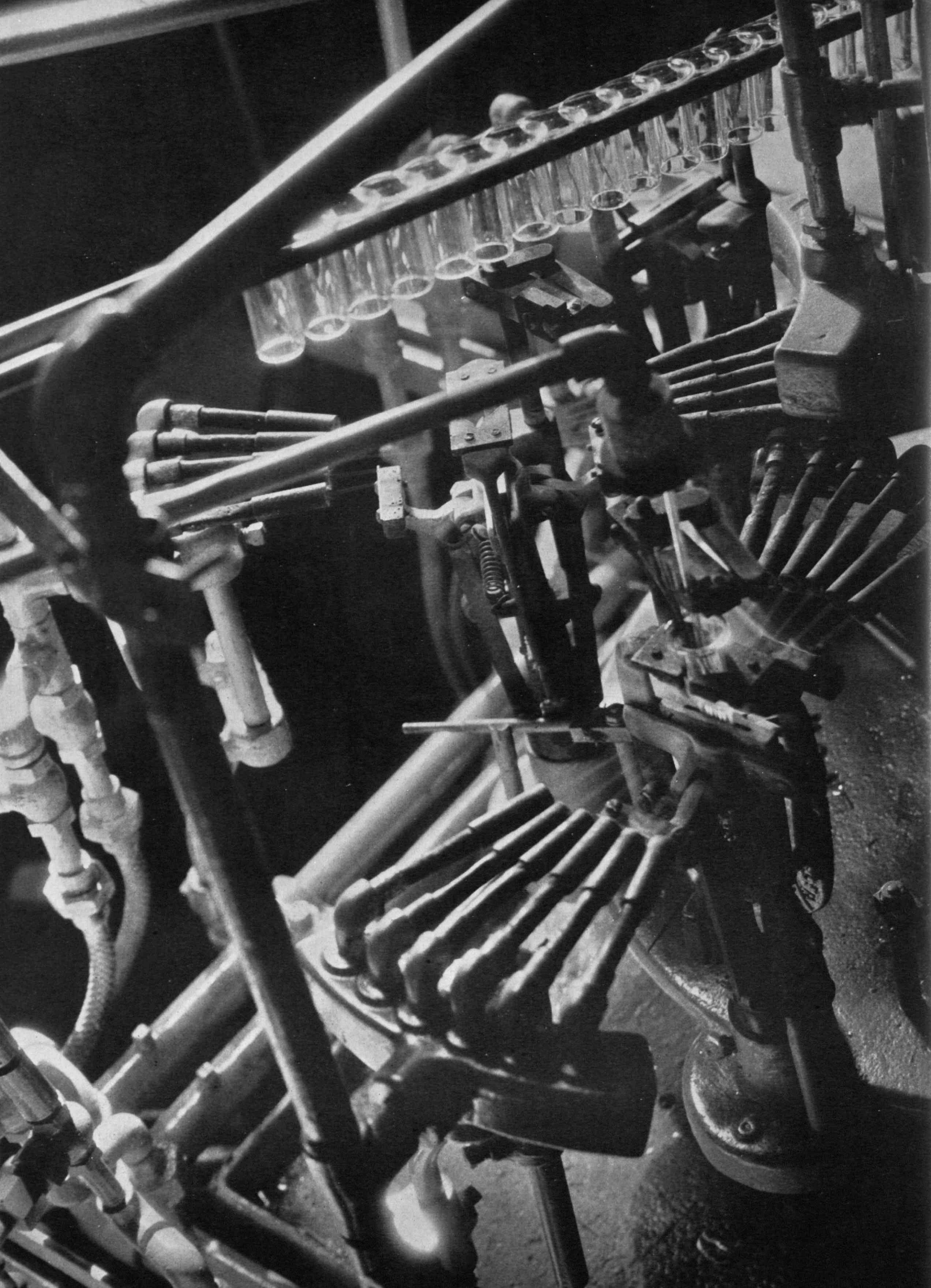
"Dry Flo" Tank Car

LAST February The Review had something to say about self-unloading ships — a type of bulk cargo carrier which has reached its highest development in the merchant marine of the Great Lakes — and reported how these specialized vessels were made use of in transporting, not only crushed rock and coal, but sand and cement. Word now comes of a "dry-flo" railway tank car to expedite the handling of unbagged cement and other powdery commodities by the General American Tank Car Corporation which, in the course of the last 20 years or so, has built up its present business of leasing some 50,000-odd refrigerator and liquid-carrying tank cars to railroads and shippers.

Experimental work, in coöperation with the Link-Belt Company, has been underway for over a year on this new type of car which, in outward appearance, is not unlike the familiar railway tank car designed for oil, gasoline, and other liquids. The earliest model of a car to handle dry-flowing commodities employed the screw conveyor idea. Two such devices were placed at the bottom of the inside of the car, each feeding into a discharge hopper at the center. This screw conveyor scheme is one of two successful schemes used afloat, the other being the tunnel scraper system. The latter method, by way of interest, was used on the coal carrier S. S. *H. F. De Bardeleben* which foundered in a North Atlantic gale last March. For railroad transport, however, the screw conveyor principle was unsatisfactory because material such as cement, after being moved any considerable distance by rail, packs so solidly that the machinery cannot function.

Endless chain conveyors, the principle used in the early self-unloading ships (the *Hennepin* of 1902 and the *Topeka* of 1905), were therefore tried and found practicable.

Hence, in the inside of each half of the latest "dry-flo" car there is a chain conveyor which moves along the top away from the center of the car, down the side at the end, and back toward the center along the bottom to the discharge hopper. A motor to operate these conveyors is located at the top center and the whole process is carried out under seal which gets rid of dust and odors and makes for safety in the handling process.



THE INSTITUTE GAZETTE

To the Alumni:

The Committee on Graduation Exercises and Senior Week extends a cordial invitation to the Alumni and their guests to attend the President's Reception to the Graduates on Tuesday afternoon, June 7, from three-thirty to five-thirty in the Walker Memorial.

Refreshments will be served from tables with departmental designations arranged in alphabetical order under the balconies. It is believed that the alumni in the vicinity will appreciate this opportunity to attend one of the functions of Commencement Day and renew acquaintance with the Faculty and fellow Alumni.

The laboratories of the Institute will be open for inspection from two to four on the same afternoon. The Alumni are thus enabled to maintain contact with both personnel and equipment.

R. G. HUDSON, *Chairman*
Committee on Graduation
Exercises and Senior Week

Graduation Speaker

SIR HENRY W. THORNTON, President of the Canadian National Railways, and one of the most distinguished figures in the field of transportation, will be the Commencement speaker at Technology's graduation exercises referred to above. Sir Henry's engineering works include the operation of railroads in the United States and England, as well as in Canada.

Although he is a native of Indiana and was educated at St. Paul's School, Concord, N. H., and at the University of Pennsylvania, he is now a British subject. His career as an engineer began as a draftsman on the Pennsylvania Railroad. His progress was rapid, and he held responsible positions on various American railroads before he became general manager of the Great Eastern Railway in England in 1914.

During the Great War, he was a member of the executive committee of managers which directed the operation of all English railway systems. He was also deputy director of inland water transportation, and held the rank of Colonel in the Royal Engineers.

In 1917 he was appointed assistant director-general of movement of railways in France and, in 1918, he became a member of the commission appointed to investigate the operations and financial condition of the metropolitan water board of the City of London. His appointment as Chairman and President of the Canadian National Railways came in 1922. He became a Knight Commander in the Order of the British Empire in 1919, and is a Companion of the Legion of Honor of France, and an officer in the Belgian Order of Leopold. He was awarded the Distinguished Service Medal by the United States.

The 157th Meeting of the Alumni Council

THIS was a combined meeting with the Faculty Club of the Institute, and was preceded by the usual dinner in the North Hall of Walker Memorial on February 29, at 6:45 P.M., with a total of 95 men present. During the salad course, President Dewey called upon Colonel Frank L. Locke, '86, Personnel Director of the D. I. C. & R., to report on his recent trip to Wilmington, Philadelphia, Baltimore, Washington, Harrisburg, and Pittsburgh. Colonel Locke spoke very enthusiastically of the interest he found in various places and mentioned especially the strong likelihood that a Technology club would be formed in Wilmington as an outcome of his trip.

The Secretary reported that at the meeting of the Executive Committee prior to the dinner, J. Rhyne Killian, Jr., '26, Treasurer of the Alumni Association, reported that, "despite a small attendance, the Annual Dinner was operated with a smaller deficit this year than last. In 1931 there was a deficit of $822.00 and this year only $635.00. The Committee on Assemblies is to be commended for the efficiency and economy with which they staged this annual affair." Dean Harold E. Lobdell, '17, reporting for The Review, stated that dues collection to date totaled 6,871 or 7% less than a year ago.

Additional items reported by the Secretary were that 13 new members were elected to the Alumni Association; that the March meeting would offer an opportunity to hear all about the new Physics and Chemistry Building, and especially the new Spectroscopy Laboratory; that annual ballots are well under way to go out as of March 19; that two new Honorary Secretaries-at-large had been appointed — Clarence B. Rogers, '14, and Azel W. Mack, '15; that flowers had been sent in the name of the Alumni Association to the funeral of Henry L. J. Warren, '75; that the Alumni flag was flown on the flag pole Saturday, February 6, the day of the Alumni Dinner; that visitations to local Alumni clubs still continued in good numbers, including Dr. Compton's trip to Syracuse on February 15, Dr. Tryon's trip to Columbus and Cincinnati in April, the meeting for Professor C. Frank Allen, '72, at El Paso, with nine men present, and larger meetings in Los Angeles and San Francisco; Colonel Locke's trip as mentioned above; and finally Dr. Allan Winter Rowe's ['01] trips to Atlanta and Birmingham in March, and to Richmond, New Orleans, St. Louis, Indianapolis, Cincinnati, Columbus, and Dayton in May.

Mr. Henry B. Shepard, '16, Chairman of the Committee on Assemblies reported informally on the Alumni Dinner and put up to the Council five proposals on

MAKING RADIO TUBES

From a photograph by William M. Rittase

which they are to express their feeling by a show of hands at the next meeting. These were: (1) A lower price for the dinner; (2) Meeting in Walker Memorial instead of Hotel Statler; (3) Making it a gentlemen's affair without the ladies and dancing; (4) Change the character from a regular dinner to a sort of buffet smoker; (5) Entertainment to be supplied by undergraduates.

Having finished all of the foregoing business, Chairman Bradley Dewey, '09, turned the meeting over to Professor Dean Peabody, Jr., '10, the President of the Technology Faculty Club. Professor Peabody called in turn upon Professor Edward F. Miller, '86, Professor William P. Ryan, '18, and Professor Erwin H. Schell, '12. Professor Miller told what was being done in the Department of Mechanical Engineering toward improving the curriculum and getting graduates properly prepared for industry, and furthermore getting a graduate into a position for which he was best suited. He submitted data on mimeographed sheets giving results of surveys of different schools for the purpose of comparing curricula, lines of work into which graduates went, and the salaries which they secured at various periods after graduating.

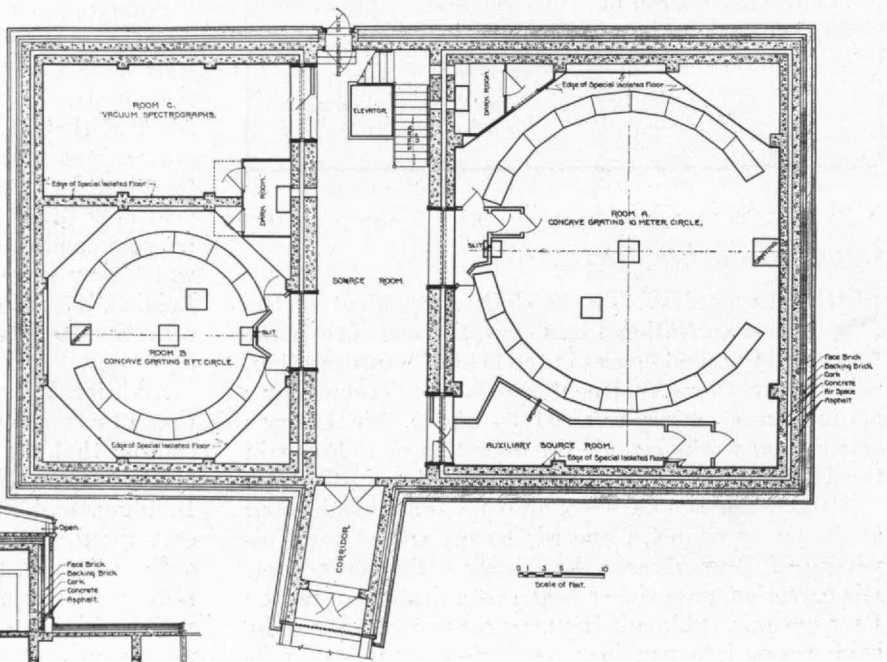
Professor Ryan dealt with chemical engineers along the same lines and likewise Professor Schell presented the results of studies made by Professor Karl D. Fernstrom, '10, on Technology graduates in Business Administration.

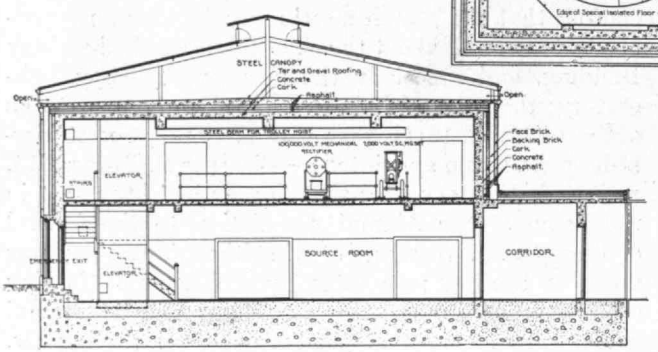
The 158th Meeting of the Alumni Council

AT THIS meeting as well as the above, most of the speaking was done by members of the Institute's Corporation and Faculty. The theme song of this speaking was Technology's new research facilities in physics and chemistry. President Compton gave, as he expressed it, the "background and forefront" of the new buildings, giving for the former excerpts from the minutes of the Executive Committee and of the Corporation which dealt with the origin and planning of the new buildings and for the latter the actual (*Concluded on page 358*)

"A Ten-Room Building Within a Refrigerator"

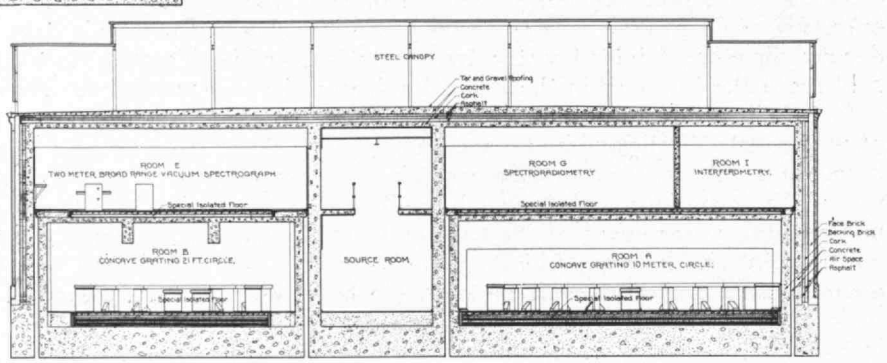
Technology's Spectroscopy Laboratory now in use. On the right is the first floor plan showing the arrangement of the two "round-tables of light." The building is remarkably well insulated for both heat and vibration





Left: Transverse section. When the Department of Mining and Metallurgy had its annual stampmill-run recently, the resulting vibrations could not be detected in this nearby laboratory

Right: Longitudinal section. Note roof and wall construction. This laboratory, an adjunct to the new George Eastman Research Laboratories, was described in the October, 1931, Review. For interior pictures see pages 280 and 281 of the April Review



Plans by courtesy of Charles T. Main, Inc.
(Charles T. Main, '76 — Charles R. Main, '09)

WORKING MATHEMATICS BY MACHINERY

(*Continued from page 327*)

performs the integration of a special product function. Lord Kelvin may be credited with the invention of the first harmonic analyzer for he observed in 1876 that his brother's integrator could be used to evaluate the Fourier coefficients. An eleven-element analyzer of this type was built for, and used by, the Admiralty for tidal data analysis. Since that time the ambition to invent the perfect harmonic analyzer has haunted many a man, though largely in vain. Among the analyzers which have been significant may be mentioned that of Henrici (1894) [built by Coradi], of Michelson and Stratton (1898), and of Chubb (1914).

Because of their close association with harmonic analyzers, harmonic synthesizers should be mentioned. Lord Kelvin's name again appears prominently, as the first device was built to his design by J. White of Glasgow,[6] although the method had been previously used by Bashforth in 1845 and by W. H. L. Russell in 1869. A similar machine was soon made for the U. S. Coast and Geodetic Survey followed by a later model,[7] well-known now as the "big brass brain." These machines have been of tremendous aid in the calculation of tide tables.

The foregoing devices are all intended primarily for evaluating a definite integral between fixed limits represented geometrically as the area bounded by a closed curve. Another problem, mathematically more important, is the evaluation of a definite integral with a variable upper limit as a function of this limit. Machines for performing this operation are usually called integraphs. Coriolis apparently conceived the first device of this sort in 1836, which consisted of a string wound on a cylinder. By making the slope of the string with respect to an element of the cylinder continuously equal to the ordinate of the curve to be integrated, the curve formed by the string on the cylinder becomes the desired integral curve. In geometrical concept, the integraphs of Abdank Abakanowicz in France and Boys in England (both announced in 1878) are similar to this, except that the string is replaced by a sharp wheel which moves without sliding and traces the integral curve. Prior to this last development, Zmurko, in 1861, made the Wetli planimeter recording, thereby converting it into an integraph. J. Thomson, in 1875, also made his integrator continuously recording, which in the hands of his brother, Lord Kelvin, led to a more significant development mentioned below. In 1925 a Product Integraph, which, as its name indicates, recorded graphically the integral of the product of two functions, was developed in the Electrical Engineering Research Laboratory of the Institute by staff members under the direction of Vannevar Bush,[8] D.Eng. '16. Although intended primarily for the solution of certain transmission-line transient problems, it was used on a variety of others. Integraphs are particularly useful in such other problems as the determination of the moment, slope, and deflection of an irregularly loaded beam.

Although explicit integration often offers sufficient difficulties to make the use of mechanical integrators attractive, the problem of (*Continued on page 344*)

CO-OPERATIVE ORDERS

THE Co-operative desires to make some explanation regarding its "Order System." The Co-operative Society has gradually developed arrangements with mercantile establishments of high standing in Boston, whereby orders from the Society may be presented and honored at these stores. This method possesses obvious advantages, particularly to members with families, and it is maintained very largely for their convenience.

It enables members to make purchases of goods which the Co-operative does not carry in stock and to secure dividends upon such purchases at regular prices. Further information will be given gladly at the Cashier's window.

RULES AND REGULATIONS

Orders may be secured at the Society's store. These orders will be honored at the stores designated thereon, and the goods delivered as instructed, and charged to the Co-operative. A dividend is given on these purchases.

Orders must be obtained before making selections, since merchants invariably refuse to credit the Society with the sale unless the order is immediately presented. Orders mailed upon request to charge customers.

The following is a partial list of houses upon which orders must be obtained

A. G. Spalding	Athletic Goods
Wright & Ditson	Athletic Goods
Simmons Co.	Beds
Jones, McDuffee & Stratton	Crockery
Barker Shirt	Custom Shirts
Dame, Stoddard & Co.	Cutlery
Graybar Electric Co.	Electrical Goods
Geo. H. Wahn Co.	Electrical Goods
Milhender Electric Co.	Electrical Goods
Peck & Hills	Furniture
Rapids Furniture Co.	Furniture
Spaulding & Riedel Inc.	Furs, Cold Storage
Thomas Long Co.	Jewelry
D. C. Percival	Jewelry
London Harness Co.	Leather Goods
E. L. Ham & Co.	Rugs and Carpets
C. C. Bailey Co.	Rugs and Carpets
Artloom Rug Mills Co.	Rugs and Carpets
Ward's	Stationery
Thorp & Martin Co.	Stationery
Jones, Peterson & Newhall	Women's Shoes
T. E. Moseley	Women's Shoes

Technology Branch

HARVARD CO-OPERATIVE SOCIETY

HARVARD SQUARE

WORKING MATHEMATICS BY MACHINERY

(*Continued from page 342*)

solving differential equations is much more formidable and important physically. The first step toward the use of machines in this field was taken by Lord Kelvin[9] in 1875 when he saw how, by interrelating the output of one or more of his brother's integrating units, he could solve ordinary differential equations. For mechanical reasons readily appreciated by one who has worked with such devices, serious difficulties would have been encountered had Kelvin attempted to apply this idea extensively. He clearly visualized and formulated the basic ideas, however. In fact, he gave a layout for the mechanical solution of the n-body gravitational problem, the general solution of which has been the fond ambition of mathematical astronomers for centuries.

IT WAS not until 1926 that another general attack was started on this problem, although Professor Pascal of Naples had built numerous integraphs for solving various specific differential equations. In 1926 the M. I. T. Product Integraph, after being augmented by a second stage of integration, became capable of solving rather general second-order ordinary differential equations, including definite boundary or initial conditions, within one or two per cent.[10] Based upon the experience obtained in the construction and operation of this machine, a much more accurate and flexible device called the Differential Analyzer[11] has been built and is now in operation in the M. I. T. Electrical Engineering Research Laboratory. On it ordinary differential equations of as high order as the sixth can be solved with an accuracy limited by the accuracy with which plots of coefficients can be made on a sheet 18 x 24 inches. The integrators, which are of the Wetli wheel-and-disk type, have an accuracy of one part in two to five thousand under conditions of actual use. Thus, the Differential Analyzer is an instrument of real power. It has been proven so on numerous difficult problems, otherwise approachable only through the medium of numerous point-by-point calculations so long as to constitute an almost prohibitive barrier to their solution.[12]

An interesting possibility of the Differential Analyzer is its use as a "differential engine" analogous to Babbage's Difference Engine. Whereas the latter built up a function from finite differences of a given order, the Differential Analyzer can build up a function from a knowledge of its derivative of sixth or less order and the initial values of lower order derivatives.

When considering the mechanical solution of differential equations, it may well be asked why integrators instead of differentiators are used. There are at least two reasons. First, by integration a function is built up that satisfies the equation, whereas by differentiation one can only find a relation between derivatives of an arbitrarily assumed function. Therefore, the direct explicit process is integration. The second reason lies in the meager information concerning (*Continued on page 345*)

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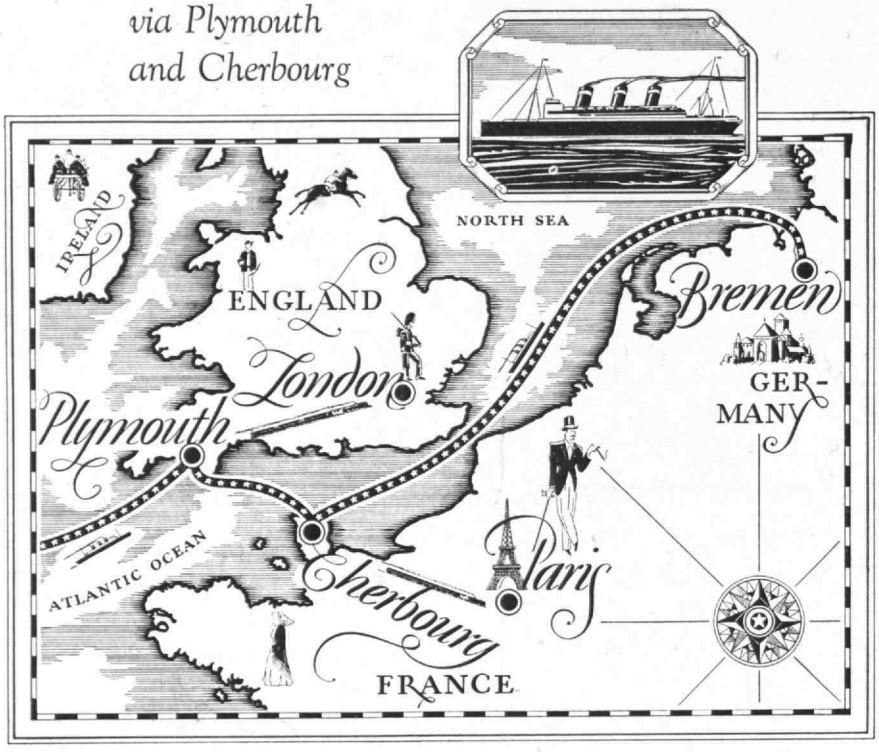

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WORKING MATHEMATICS BY MACHINERY

(*Continued from page 344*)

derivatives contained in any graphically expressed function. Slight local irregularities in a curve affect its integral but little, although they alter its derivative greatly. Thus, although differentiators have been invented, notably those of Helle-Shaw, Murray (1904), and Elmendorf (1916), their use has been confined to simple slope-taking.

RETURNING to integrating devices, what is probably the most advanced work is that under way in the Electrical Engineering Research Laboratory under the direction of Vannevar Bush. K. E. Gould, '25,[13] (1927) and T. S. Gray, '28,[14] (1930) built radiation integraphs on which the integral of the product of two functions was obtained by a single reading and could be plotted continuously as a function of a parameter. Gould used infra-red radiation with a thermopile detector which proved very sensitive to extraneous interference. Gray used white light with a photoelectric cell. At present this line of attack is being further developed with the idea of obtaining a rapid, accurate evaluation of parametric integrals and an effective computational solution of certain physically important integral equations. Such mathematical formulations occur in periodogram and correlation analysis, in the analysis of the fields of heat, magnetism, electricity, fluid flow and elasticity, and in circuit problems, to mention a few examples. A machine of this sort has great potentialities and the practical difficulties, which too often completely spoil pencil-and-paper machines, are apparently surmountable at reasonable expense.[15]

In this extremely brief sketch of the history of calculating machines and instruments, space has permitted but little of the interesting detail. Numerous specialized or merely novel devices have been entirely omitted. Many important names have not even been mentioned, each of which would be the subject of an interesting story. The development in each of the somewhat separate fields has been the work of many men, particularly in those cases where the development has grown to commercial proportions.

Thanks to these many men, our present facilities for relieving the brain of the arduous routine of computation are indispensable. Many computational difficulties are still to be ameliorated before vast areas in the domain of powerful mathematical analysis can be exploited for the solution of pressing physical problems. This is a challenge to the engineer who feels a compelling need for more powerful analysis and who has at his disposal a rapidly increasing number of tools and materials with which to overcome the practical limitations that blocked earlier workers in this field. The last two decades have seen an enormous increase in such resources. A most serious limitation which Kelvin and earlier men faced was the discrepancy between the energy available from a delicate, accurate calculating mechanism and that required to operate dependent apparatus. Today the vacuum tube and mechanical energy amplifiers remove this limitation. Precise machining and testing methods render mechanical construction adequate. A host of new materials and techniques revolutionize design possibilities. These facilities have only begun to be exploited in the field of (*Concluded on page 346*)

WORKING MATHEMATICS BY MACHINERY

(*Concluded from page 345*)

calculating devices. Leibniz, with his practical visions of applied mathematics freed from the labor of routine computations, would find himself in a seventh heaven were he to visit us today. Though he is gone, his visions persist in the minds of men now active and bear fruit.

We shall not see the day when all computational difficulties are removed, for analysis is always being extended, introducing new problems as rapidly as old ones are solved. However, we shall see many of our present difficulties removed by machines and the dependent sciences correspondingly advanced.

[1] A translation of interesting portions of Leibniz's and Pascal's original descriptions is readily available in the "Source Book in Mathematics" edited by D. E. Smith, McGraw-Hill, 1929.

[2] Excellent descriptions of most of these machines and bibliography are found in Horsburgh "Napier Tercentenary Celebration Handbook" R. Soc. of Edin. 1914. See also Baxandall "Calculating Machines and Instruments," H. M. S. Stationary Office, 1926.

[3] Babbage's papers and others relating to his work including the "A. L. L." notes are found in "Charles Babbage, Calculating Engines" published by H. P. Babbage, London, 1889.

[4] A description and bibliography are given in Hazen, Schurig, and Gardner, "The M. I. T. Network Analyzer" *Trans.* A. I. E. E., 1930.

[5] Horsburgh, *loc. cit.* See also Enc. Brit. 11th ed. Article "Calculating Instruments."

[6] Baxandale, *loc. cit.*

[7] U. S. C. and G. S. Special Pub. No. 32.

[8] Bush, Gage, and Stewart "A Continuous Integraph" *Journal of the Franklin Institute*, 1927.

[9] Sir William Thomson, *Proc.* Roy. Soc. 1876.

[10] Bush and Hazen, "Integraph Solution of Differential Equations" *J. F. I.*, 1927.

[11] V. Bush, "The Differential Analyzer" *J. F. I.*, Oct., 1931. The bibliography of this paper covers work done on the 1926 model.

[12] Bush and Caldwell, "Thomas-Fermi Equation Solution by the Differential Analyzer" *Phys. Rev.* Nov. 15, 1931. P. M. Morse, "Quantum Mechanics of Collision Process" to be published in *Rev. of Mod. Phys.*

[13] K. E. Gould, "A New Machine for Integrating a Functional Product," *J. Math. & Physics*, 1929.

[14] T. S. Gray, "A Photoelectric Integraph" *J. F. I.*, July, 1931.

[15] In the author's M. I. T. Sc.D. thesis, "The Extension of Electrical Engineering Analysis through the Reduction of Computational Limitations by Mechanical Methods" the specific needs for this and other types of devices are treated in detail.

Works not mentioned in the footnotes, which treat this subject in a historical and descriptive way and which have bibliographies of original sources are:

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Arrest At Varennes

Dark days in France were those after July 1789 when the Bastille, symbol of political suppression, was stormed by Parisian mobs, led by portly, enraged shop women. For sickly King Louis XVI there followed ominous months, filled with jeers and insults from petite bourgoisie. Royal edicts no longer impressed the rabid Assembly, intoxicated with Montesquieu's doctrines of the equality of man. By June 1791 the Capet blood was rapidly becoming less blue and more watery as the sixteenth Louis shivered in the Tuileries.

As TIME, had it been published June 25, 1791, would have reported subsequent events:

. . . . Cast aside were wigs and brocade by timid King Louis and his family as they fled last week from Paris disguised as servants. Successfully plans and preparations of Count Axel ("Friend of the Queen") Fersen were carried out as Baroness Korff (an unidentified servant) and her attendants (King Louis as valet, Queen Marie Antoinette as governess) passed the revolutionary guards with faked passports. Then delays and Royal indiscretion made of careful plans a tragedy of errors.

At Somme-Vesle impatient young Duc de Choiseul waited four hours for the royal shipment, dismissed his hussars at sunset, sent word along the route: "'Treasure' delayed."

His body guard from Somme-Vesle to the frontier missing, King Louis himself anxiously looked for it in Sainte-Menehould through the carriage window, was recognized by the village postmaster's son, Drouet, ardent Revolutionist. Instantly Drouet set off to prevent the escape . . . .

Gasping for breath after a wild ride over back roads through the blackness of Argonne Forest, ex-dragoon Drouet aroused rustic night owls at *Le Bras d'Or* at Varennes crying, "To arms!" A half hour later brakes complained on the hill above town and a heavy coach came to a stop before an overturned cart barricading the road. Torchlight gleamed on half a hundred bayonets as Drouet, and Varennes Procurator Sauce, took the protesting royal family prisoners.

News of the flight spread like wildfire, armed peasants poured in from the countryside. Choiseul's hussars blundered into Varennes too late, urged Louis to force his way out. Louis vacillated. Many royal soldiers were shot as they tried unsuccessfully to clear the town.

With dawn, thundering hoofs from Paris pounded out the knell of Monarchy. Sorrowful M. Romeuf, aide-de-camp to La Fayette, strode into Sauce's house hating his errand, respectfully presented the National Assembly's order of arrest. Royalty glanced through the document, smiled bitterly. Said Louis Capet: "There is no longer a King of France!"

MAKING VAIN MEN HUMBLE

(*Concluded from page 322*)

may find in apparently simple things, which really are never quite simple, and it reminded me that we had used Franklin's lightning for firing millions of rods to be used in the electrical industry for keeping lightning out of power stations. We had enjoyed working very close to a field of that grand old master's.

I give those details not to record success, but to point a certain moral. In learning from those who knew porcelain, we were wise. By thus learning how we could help them, we turned the natural scorn of good, practical men for meddlers into a feeling of satisfaction that there was added to their department a new product and interesting new electrical furnaces.

I am deliberately choosing apparently insignificant research for reference, to show that pleasure and usefulness may meet the young research man in different guises. In my early days, there was great difficulty in getting electric current into the motors and out of the generators through the rotating surfaces. The so-called brushes were first made of copper. Then carbon brushes came into use. The brushes were cheap little blocks of carbon, but their defects frequently stalled long lines of electric cars in our cities. At first one might look at such a subject as quite uninteresting from a scientific standpoint, but it is capable of very interesting analysis. Carbon is not a simple thing. If there were no difference between lampblack, graphite, and diamonds, there would still be the fact that carbons resulting from heating different organic materials, like wood, gums, and tars, all differ enormously. When we came to study the electrical properties of carbon, we also found infinite variety. It is improper and impossible in this short paper to cover the subject, but here again, after years of useful development, we are still studying brushes in new applications, and more severe requirements are always being advanced. I always think of that dirty work as something apparently uninviting, yet having in it just the same sort of pleasant, scientific regularity and dependability that the clean, transparent, apparently simple incandescent lamp displays.

It is certain that the pleasures in store for young research men in American industries are infinite. It is also true that many of them may be found quite close to simple materials.

INTO THE FOOTHILLS OF THE ATMOSPHERE

(*Continued from page 330*)

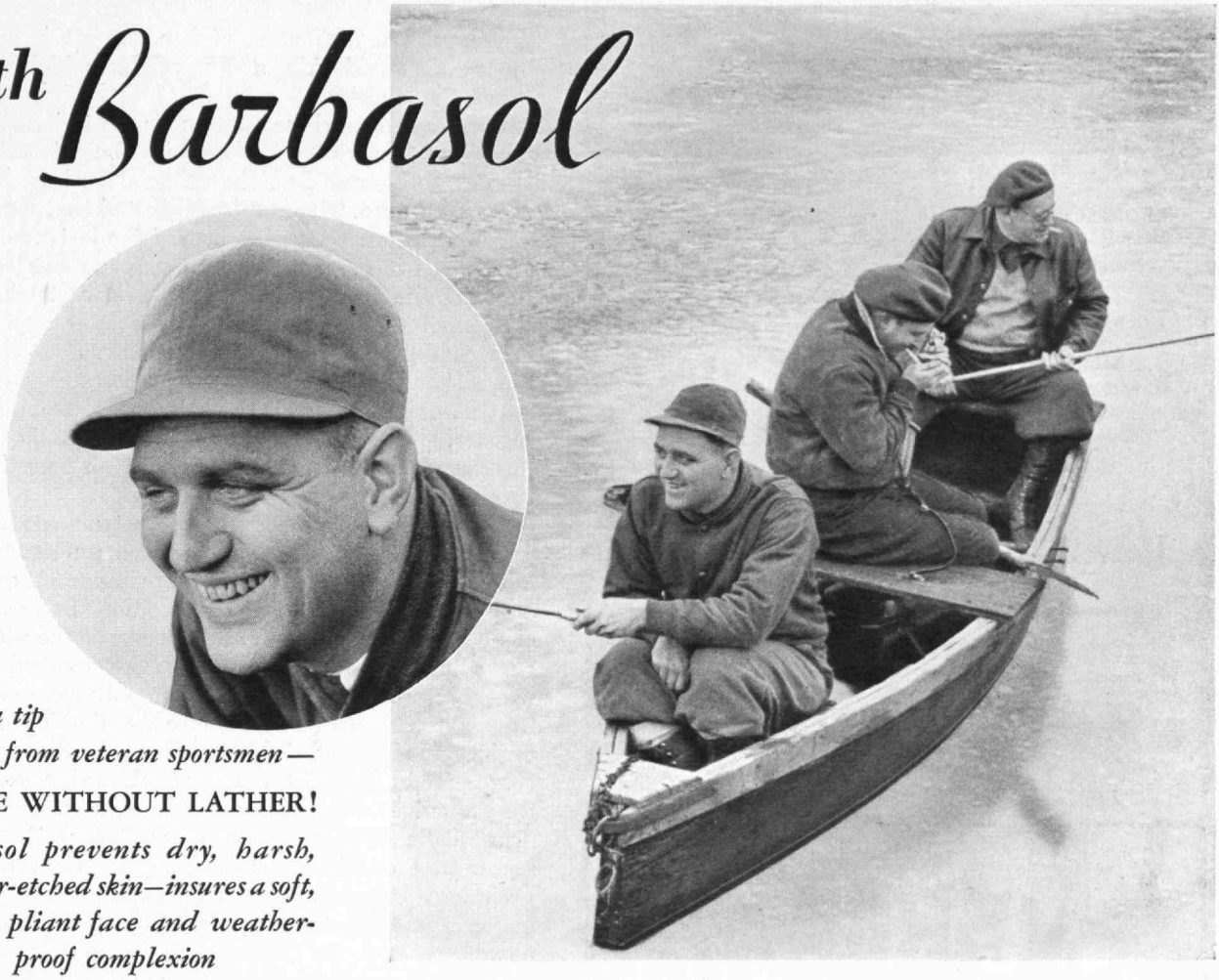
except to aid in holding a heading indicated as the proper one by observation of the ground path and the map.

It cannot be strongly enough emphasized that any attempt at blind flying with no other instruments than the above is one of the surest methods of avoiding old age. It was once my experience to be flying with a friend down a valley in the White Mountains when a stratus cloud layer was lying just at the top of the adjacent hills. The valley turned a corner and a down draft had filled it completely with this cloud. Being in it before we could turn, we saw in quick succession and at very close range, a barn, a granite cliff, a patch of blue sky, and some railroad tracks, not down below, but somewhere up overhead. After milling about for about three minutes, we passed as we thought through the cloud and landed in a small field and a cold sweat only to find that instead of having come through the cloud, we had come back out of it. There may be some people with a blind flying sense, but I am not one of them, and have never met anyone who *knew* that he was.

When we secured our plane it was equipped with the six common instruments mentioned above. To this array has been added three gyroscopic instruments, a bank indicator, inclinometer, two vacuum gauges, a cup-anemometer type of air speed indicator, clock, Kollsman altimeter with a precision of 20 feet, aperiodic compass, wing thermometer, radio receiving set, and sundry plumbing. As meteorological equipment in the cabin, there were installed, push buttons for making time marks on the meteorographs, a note board for cloud bumpiness and ice observations, and a Brownie camera. No wonder the pilots around the East Boston Air Port call it the flying Christmas tree.

In penetrating a layer of cloud (and some flights have been up through 10,000 feet of it) there are two separate groups of instruments which aid in keeping right side up and on the desired course. The first combination consists of the turn-indicating gyroscope, the bank-indicating level bubble, and the air speed indicator. The turn indicator is a small gyroscope driven by an air turbine. It is so pivoted that a hand on the dial face indicates a right or left turn when a change of horizontal path is made. The amount of bank is shown by a level bubble placed across (*Continued on page 352*)

Faces that laugh at weather *are shaved with* Barbasol



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Barbasol prevents dry, harsh, weather-etched skin—insures a soft, smooth, pliant face and weather-proof complexion

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FRANK B. SHIELDS, 1907 • EDWIN M. McNALLY, 1918 • LEON P. BREZINSKI, 1929

INTO THE FOOTHILLS OF THE ATMOSPHERE

(*Continued from page 350*)

the plane. The inclination of fore and aft is indicated by the air speed (*i. e.* a dive produces high speed, a climb, the reverse).

Independent of these, and under most circumstances somewhat superior, is a combination of two more gyroscopic instruments, the artificial horizon, and the directional gyro. The first is so pivoted that it moves a bar up or down across the face of the instrument dial, or inclines it or combines the two motions so as to simulate the position of the real horizon in relation to the plane. An actual representation of the plan is fixed in the middle of the dial to facilitate the pilot's visualization of his position. The directional gyro is designed so that it maintains its direction in the horizontal plane, registering the actual heading of the plane in degrees, just as would a compass, yet with no swinging and turning errors.

Keeping these two groups of instruments at their proper readings is, of course, the chief concern the pilot has in a cloud. Yet, there is one more important consideration and that is the ground position. In or above a cloud, there is no knowing the velocity of the wind. The prevailing winds at high altitudes are from southwest, west, or northwest, and they commonly have velocities from 40 to 90 miles an hour. Since the climbing air speed of the plane is about 60 miles per hour, there is no surety that it might not drift actually backward in relation to the ground. In the vicinity of Boston, such a backward drift might carry the plane out to sea. It is for this reason that a radio is used, utilizing the Department of Commerce Airways Beacon, located at Boston. The major axis of this beacon points toward Hartford. It is possible to "ride the beam" to the vertical or to choose the northwest or southwest quadrants for the flight, and consequently to make sure that the plane is not carried out to sea.

In addition to the beam signals, the pilot secures every 20 minutes weather reports from New England Stations broadcast on the same wave lengths. Further arrangements have been made for a special message to be sent to our plane in case fog begins to close in at the Airport. This closing in of fog is perhaps our one real hazard, since we cannot land without visibility. We, therefore, never undertake flights with less than 800 feet of ceiling at the Airport.

When ice occurs, as it usually does when temperatures in a cloud layer are between 10°F. and 32°F., certain complications ensue. The weight of the ice and the resistance it sets up are not important for our purpose since we do not remain in it very long. But the ice does mess up the instruments, since normally all the gyroscopic instruments are driven from Venturi tubes mounted above the wing. The air speed Pitot tube is also exposed. When ice forms, it clogs the openings in these tubes with the result that their respective instruments are cut out. Through an ingenious and elaborate system of piping evolved by C. S. Draper of the Department of Aeronautical Engineering, the instruments are now switched so as to be driven (*Concluded on page 354*)

INTO THE FOOTHILLS OF THE ATMOSPHERE

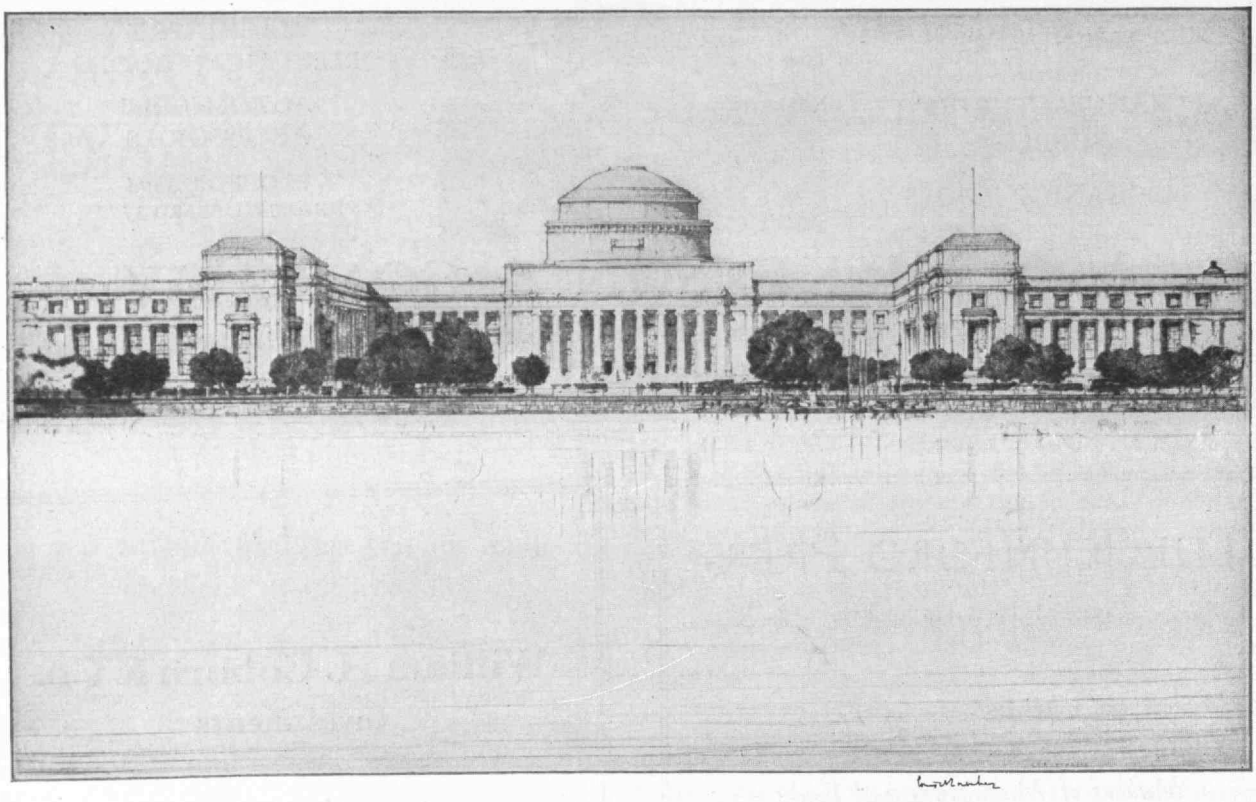
(*Concluded from page 352*)

by the intake manifold suction of the engine. This suction is sufficient to run them except near full throttle conditions. This means that we can maintain height or descend under control, but that we can hardly climb. The cup type air speed indicator is also now a useful guide especially when checked against the inclinometer. Nevertheless, in general, iced instruments terminate a flight.

Rate of descent in any weather is purely a matter of taste. Usually, we take about ten minutes.

A VERY common reaction expressed by a number of people who have looked over the above-described equipment is one of wonder that a single individual could be expected to pay attention to all of it. Certainly the navigation of the plane and the routine meteorological notes do absorb any one pilot's time quite completely. I sometimes have wondered as instrument after instrument was added whether one of them might not be the proverbial back-breaking straw and instead of proving an additional aid would only serve to throw the entire equipment into confusion. In my busiest moments I often reflect on the comparatively quiet life of one-armed paper hangers and players of movie palace pipe organs. Seriously, however, there is no doubt that a great deal more valuable scientific work may be done if an airplane can be secured which would permit a second person to be taken along whose sole function would be that of scientific observer.

Quite a large number of additional researches have from time to time been suggested. A study of the distribution of microscopic organisms throughout the atmosphere, of the intensity of cosmic rays at high altitudes above the surface of the earth, of measurements of air gustiness by means of an accelerometer, of the affect of various atmospheric situations upon the earth's magnetic field, of special methods of ascertaining wind magnitudes and directions above cloud layers, and a special investigation to determine the number of gypsy moths in the air between Boston and Plymouth are among the principal ones so far suggested.



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Kingston, Pa.

INSTITUTE GAZETTE

(Concluded from page 340)

status of the building today. Professor Frederick G. Keyes, Head of the Department of Chemistry, reviewed the development of research in chemistry here at Technology, bringing it down to the present day when, as he aptly expressed it, the sciences of physics and chemistry which so long have been living together have finally decided to become married.

Professor John C. Slater, Head of the Department of Physics, discussed still further the relationship between physics and chemistry, although he pointed out certain essential differences between them. "Chemistry," he said, "is a wet art, while physics is an electrical art." He demonstrated the truth of this by pointing out how much more plumbing was required in the half of the building occupied by chemistry than in the other half occupied by physics.

George R. Harrison, Professor of Physics and Director of the Research Laboratory of Experimental Physics, described the spectroscopy laboratory (see The Technology Review for October, 1931). Harry J. Carlson, '92, architect of the George Eastman Research Laboratories, was called upon as the last speaker.

Preceding this program of speeches, there was a business meeting which was called to order at 8 P.M. by Vice-President Donald G. Robbins, '07, in the absence of Bradley Dewey, '09, who had gone to Detroit to speak to the Technology Club there.

The Secretary reported on items of business transacted at the meeting of the Executive Committee prior to the dinner that J. Rhyne Killian, Jr., '26, Treasurer of the Association, reported that as of March 1 the financial statement of the Association showed a small operating surplus for the year, to date. This surplus of $468.00 is less than that on the same date last year by an amount almost exactly equal to the decline in dues income, that is, $1,000; and Harold E. Lobdell, '17, reporting for The Review stated that dues collections as of today, totaled 6,934 which is 614 or 8.2% less than on March 28, 1931. Two new members had been elected to the Association; flowers had been sent to the funeral of Professor Winward Prescott in the name of the Alumni Association and their receipt acknowledged; George A. Packard, '90, had been nominated a member of the Special Committee to Nominate Members for Advisory Councils in place of Mr. Killian, resigned. Professor C. F. Allen, '72, also reported briefly on his recent western trip.

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PREPARED BY JOHN J. ROWLANDS, DIRECTOR, INSTITUTE NEWS SERVICE

Delta Omega Lecture

The importance of Public Health Engineering and the significance of contributions to this field in recent years was discussed by Ralph E. Tarbett '05, Chief of the Engineering Section of the United States Public Health Service, in the Delta Omega Lecture at Technology on March 9. His subject was "The Functions of the Public Health Engineer." The lecture was given under the auspices of the Department of Biology and Public Health and Dr. Samuel C. Prescott '94, its Head, introduced Mr. Tarbett.

Mr. Tarbett traced the history of Public Health Engineering from its beginning with a study of water supply during the typhoid epidemic in Massachusetts in 1880. In 1897 a full-time engineer was for the first time employed by a health board in Ohio. With the passage of various acts by Congress in 1913, public health engineers took charge of the milk supply, the shellfish industry, lighting, ventilation, and municipal sanitation in many districts, although milk control continued to be especially poor until the adoption of a sanitary milk code in 1923. By 1926 one or two full-time public health engineers were employed by 42 states.

Important centers of activity for the modern public health engineer include, according to Mr. Tarbett, swimming pools, beaches, camps, and picnic grounds. Among the many problems confronting the profession are the extermination of insects and rodents, softening of water and removal from it of iron and unpleasant tastes, industrial hygiene, elimination of industrial atmospheric pollution, treatment of sewage and industrial wastes, noise regulation in large cities, and housing and school equipment details.

Every community with a population of 50,000 should employ an engineer on its health staff, declared Mr. Tarbett. Such an individual should have general training in the fundamentals of engineering, and in particular, a knowledge of sanitary engineering, biology, chemistry, bacteriology, epidemiology, psychology, and public health administration.

Optometry

Gold medals for outstanding achievement in eye research were presented by President Compton to the Lighting Research Laboratory of the General Electric Company, and the Department of Research in Physiological Optics of the Dartmouth Medical School, on behalf of the Distinguished Service Foundation of Optometry during a meeting of the New England Council of Optometrists at the Institute on March 8.

The award went to members of the Lighting Research Laboratory for distinguished studies in illumination and its relation to human eyesight, leading to the creation of a new science of seeing. The Dartmouth scientists received citation for the discovery of a hitherto unrecognized type of eye defect, due to small differences in the size and shape of ocular images, and for the development of apparatus and lenses by which the trouble may be detected and remedied.

Dr. Samuel C. Prescott '94, Dean of the School of Science at Technology, in an address before members of the Council on the same day, stressed the importance of thorough scientific training for the professional optometrist.

Awards

Diplomas of honorary membership were presented to President Compton and Charles T. Main '76 by the Boston Society of Civil Engineers, oldest engineering society in the country, at its 84th annual meeting on March 16.

Prizes for the presentation of noteworthy papers at society meetings during the past year were awarded to J. Stuart Crandall '27 and William M. Bassett '02, and to Herbert K. Fairbanks '20, who received the Desmond Fitz-Gerald medal.

Officers elected for the coming year include Ralph W. Horne '10, President, and Professor J. B. Babcock, 3rd. '10, Vice-President.

Appointed

Dr. Davis R. Dewey, Head of the Department of Economics at the Institute, recently was appointed by President Hoover a member of a special board to arbitrate a wage cut dispute between the Louisiana and Arkansas Railway, the Louisiana, Arkansas and Texas Railroad and their employees. Working with Dr. Dewey on the new board are Chief Justice Walter P. Stacy of the North Carolina Supreme Court and Justice Julian H. Moore of the Colorado Supreme Court.

Professor Dewey, for many years an acknowledged authority on industrial and economic problems, was twice appointed by President Coolidge during 1928 to membership on a similar board for the investigation of wage questions on western railroads.

Value of Research

The important part played by scientific and engineering research in industrial development was discussed by President Compton in a radio address on "The Value of Research to Industry" broadcast from Station WNAC in Boston on March 5. Dr. Compton spoke under the auspices of the Massachusetts Industrial Commission.

"It is the development of the art of experimentation . . . which accounts more than anything else for the rapid progress in science and engineering during the past century," Dr. Compton stated. He quoted the prophetic reply of Michael Faraday to the King of England when the latter inquired about the value of his experiments with electricity and magnetism. "My Lord," Faraday is said to have answered, "some day you can tax these things."

The notable studies of Dr. Irving Langmuir on the subject of vacuum have made possible not only the modern x-ray and radio tubes, but an improved incandescent lamp which has cut the country's electric light bill in half, Dr. Compton said.

"If the prosperity of various lines of business is examined as listed in the business index or financial rating of industrial organizations, it is strikingly demonstrated that those industries in which research has been a prominent activity are as a group at the top, whereas those industries in which research has played a very minor part are as a group at the very bottom of the financial rating."

He quoted the results of a recent survey showing that "whereas budgets for almost all services have been reduced for the year 1932, the budgets for research have actually increased to the highest figure in history."

In conclusion, Dr. Compton said, "Research has now become an absolute necessity, not only to develop business but also as an insurance to protect it."

Guest

Fred W. Shibley, Vice-President of the Bankers Trust Company of New York, was the guest of the Department of Business and Engineering Administration at a luncheon at the Institute on March 16. In the afternoon Mr. Shibley lectured on "Control Through Business Records" before one of the Department's graduate classes.

Industrial Psychology

"Too many engineers have made the mistake of utilizing science only when dealing with machines or materials or money. Men, too, can be measured," declared Walter V. Bingham, Director of the Personnel Research Federation in New York City, in the fourth Aldred Lecture at the Institute on March 18. Dr. Bingham, who is widely known for his activities in public safety work and

industrial research, took as his subject "Adventures in Industrial Psychology."

"The greatest contribution of laboratory psychology to the understanding of human nature is in what has been discovered about the nature and extent of individual differences," Dr. Bingham said. He stressed the value to industry of the scientific measurement of human accomplishment, of the progress of learning, of susceptibility to accidents, and of human feelings, attitudes, and personality, as well as capacity and skill.

One of the most striking applications of psychology to industrial management which the speaker described concerned work with the Boston Elevated Railway, where in two years Dr. Bingham and his associates succeeded in reducing the accident rate by 35%. In one year, 1928, this amounted to a reduction in collision costs of $301,000.

Results in this case were achieved, not by discharging or transferring accident-prone men, but by a painstaking scientific analysis of their individual traits. Of the factors found to bear on a motorman's successful avoidance of accidents, physique and health ranked first in importance. Then, in order, came right attitude, knowledge and skill, and natural aptitude for work of that particular character.

Dr. Bingham spoke of the need for some kind of a "psychological interferometer," and in general for more precise units and more sensitive instruments with which to measure individual traits. "We have only just begun to understand the nature of morale, of ambition, of monotony, of industrial fatigue and unrest," he said.

The speaker described instruments and methods employed in a modern psychological laboratory, and told of interesting controlled experiments designed to discover the basic laws of memory, emotional behavior, and voluntary action.

Dr. Bingham is editor of the *Personnel Journal*, and is Director and former President of the Psychological Corporation. He is a corresponding member of the British National Institute of Industrial Psychology, and an American member of the Board of the International Association for Industrial Psychology. His address in full will appear in an early issue of The Review.

Scholastic Ratings

On March 16 the Institute announced the names of 638 students who, during the first term which ended in February, maintained a high scholastic standing in their work at Technology.

Students of the first rank constituted 2.4% of the class of 1935, 2.7% of second year students, 3.2% of the third year men, and 3.9% of the seniors.

In second place were 7.2% of the first year students, 6.5% of second year men, 7.4% of the juniors, and 6.9% of the senior class.

The third rank men in this list included 12.1% of the class of 1935, 13% of the second year students, 16.6% of the third year group, and 16.4% of the senior class.

Society of Arts

"Electrons at Work in Pure and Applied Science" was the subject of the final Society of Arts Popular Science Lecture delivered at Technology by Dr. Wayne B. Nottingham, Assistant Professor of Physics, on March 13.

A demonstration of the 1,000,000-volt electric generator recently developed by Dr. Robert J. Van de Graaff, Research Associate at the Institute, formed one of many striking illustrative experiments conducted by Professor Nottingham with vacuum tubes, photo-electric cells, and low pressure gas discharge tubes.

The speaker first discussed electrons and matter, including the flow of electrons in wires, the charge and mass of individual electrons, and a description of electrons at work. He described the emission of electrons caused by light, and explained how electrons are counted and their velocity determined by light intensity and frequency.

Lastly Dr. Nottingham spoke of the emission of electrons caused by heat. In this connection he discussed the various functions of the radio vacuum tube, the cathode ray tube, the rectifier, and the grid controlled rectifier or thyratron.

On Chemistry

Dr. Tenney L. Davis, Associate Professor of Chemistry at the Institute and Contributing Editor of The Review, delivered the principal address at the 259th meeting of the northeastern section of the American Chemical Society on March 11. Professor Davis took as his subject "Observations on the History of Chemistry During a Trip to Europe."

In Tribute

Technology paid tribute to the memory of its benefactor, the late George Eastman, by a suspension of exercises during the afternoon of March 17, when funeral services were held in Rochester. President Compton, Vice-President Bush '16, and Mr. Everett Morss '85, Treasurer, represented the Institute at the funeral.

As a memorial, the oil portrait of Mr. Eastman painted by Sir Philip de Laszlo was taken from its hanging in the President's office and placed against a background of greenery and purple velvet in the main lobby of the Institute. All flags on the Institute grounds were flown at halfmast.

Election

New officers of *Voo Doo* chosen in elections of March 1 include Duke Selig, Jr. '33, Farmerville, La., General Manager; Robert G. Henry, Jr. '33, Easton, Md., Managing Editor; Pierre S. du Pont, 3rd. '33, Wilmington, Del., Business Manager; and G. Russell Eddy '33, Syracuse, N. Y., Publication Manager.

Student Employment

There has been no dearth of odd jobs this year for students seeking work at the Technology Christian Association Employment Bureau, reported *The Tech* in a recent interview with Pennell N. Aborn, Employment Secretary. Industrial and professional opportunities, however, have shown a decrease.

The number of students assisted so far this year is equivalent to 85% of those aided during the same period of 1930–31, and 67% of the number in 1929–30, which was the most successful year in the history of the bureau. Earnings have dropped slightly, totalling approximately 91% of last year's amount, and 78% of the 1929–30 earnings.

Unusual occupations listed at the bureau include exercising dogs, obtaining data for market analyses of tires and anti-freeze solutions, and testing a certain manufacturer's brand of sport shoes by playing basketball, handball, squash, and tennis.

New Tree

One of the largest flowering crab apple trees in New England, a magnificent specimen said to be more than 100 years old, recently was presented to the Institute and transplanted from Beacon Hill in Boston to du Pont Court.

The tree is 40 feet high and 38 feet in spread, and its transportation assumed the proportions of an engineering feat. Including the earth left about its roots, the tree weighed some 18 tons, and was moved through the streets at an early morning hour in order to avoid traffic complications.

The tree formerly stood in an Esplanade backyard near the foot of Pinckney Street, and for many years has constituted a landmark for Beacon Hill residents.

Undergraduates Disciplined

Four students of the Institute were ordered to give up residence in the dormitories following an investigation of a demonstration by students on the Institute grounds on the evening of April 7. Several other students were reprimanded for participating in the celebration which led to the lighting of a bonfire and interference with Cambridge firemen who were called to extinguish the fire.

The investigation was carried out by the Dormitory Board, which is composed of Professor L. F. Hamilton '14, Chairman, Dean of Students H. E. Lobdell '17, and Bursar Horace S. Ford. This board had the coöperation of the student Dormitory Committee, with which it shares responsibility for the administration of the dormitories.

The Dormitory Committee, of which Leo P. Leino '32 is Chairman, sent a letter to Fire Chief James F. Casey of Cambridge apologizing for the actions of the students. Both committees joined in a warning against future demonstrations.

ADVERSARIA

Seventy-Three's Record

¶ The following letter has been sent to The Review by GEORGE M. TOMPSON '73:

"Referring to the letter of [the late] Mr. Henry L. J. Warren, Secretary of the Class of '75, M. I. T., in the News from the Classes and Clubs in The Technology Review for February, 1932, it is claimed that the Class of '75 is the only Institute class which has held 49 Annual Dinners without missing a year. This claim is not correct. The records of the Class Association of '73, M. I. T., show that the first meeting of the Class Association was held on Tuesday, March 13, 1871. The 61st Annual Meeting and Dinner of '73, M. I. T., was held at the Hotel Bellevue, Boston, on Tuesday, June 9, 1931, at which meeting seven members of the Association were present. The total present membership is 12.

"His classmates and all interested in the Institute will be glad to know that Dr. F. H. Williams, President of our Class Association for many years, is recovering nicely from an illness which has confined him in his home most of the winter.

"I was glad to receive a letter from W. T. Leman of Chicago, saying he was quite well and was planning to be in Boston for our 62nd Annual Dinner and Meeting in June, 1932."

Honored

¶ OSCAR G. THURLOW '04, by the Alabama Power Company. In recognition of his service to the state and the power industry, the Board of Directors voted to designate the Lower Tallassee hydro-development as Thurlow Dam. Mr. Thurlow, under whose direction many of the large hydroelectric projects in the South were designed, is Vice-President of the Commonwealth and Southern Corporation.

Elected

¶ SUSAN MINNS '81, to a fellowship in the American Association for the Advancement of Science. Miss Minns is also a Fellow of the Royal Society of Arts, London.

¶ ALBERT E. WIGGIN '07, to the chairmanship of the Montana section of the American Institute of Mining and Metallurgical Engineers. Mr. Wiggin is Manager of the Montana Reduction Departments of the Anaconda Copper Mining Company, Great Falls, Mont.

Written

¶ By ERIC F. HODGINS '22 and F. ALEXANDER MAGOUN '18, a book entitled "Behemoth. The Story of Power."

¶ By RICHARD H. FRAZIER '23, Assistant Professor of Electrical Engineering at the Institute, an article entitled "Precision Method for Determining the Thermal Diffusivity of Solids" which appeared in the *Physical Review* for February 1, 1932.

Spoke

¶ CHARLES E. SMITH '00, on March 8, before the Shelton Kiwanis Club of Bridgeport, on "The Modern Trend in the Railroad." Mr. Smith, Vice-President of the New York, New Haven, and Hartford Railroad, has been actively identified with railroad administration for 32 years. As a member of the Alumni Council, he represents the New Haven County Technology Club.

¶ MARCUS A. GROSSMANN '11, on March 10, before the Chicago Section of the American Society for Steel Treating, on "Precautions on the Manufacture of Quality Steels." Mr. Grossmann is a research engineer at the Illinois Steel Company in Chicago.

¶ F. ALEXANDER MAGOUN '18, Associate Professor of Humanics, on March 9, before the Boston Society of Civil Engineers, his subject being "The Strength of Ships." On March 25, in coöperation with the morale-sustaining effort of the Massachusetts Emergency Committee on Unemployment, Professor Magoun lectured to Boston's intellectually superior unemployed on "Social Adjustment in Business and the Professions"; and on April 11, he addressed the Faculty Club at the Institute on "Student Counseling."

Rubber

¶ Among recent industrial chronicles to be issued in book form, is that entitled "Men Working: A Story of the Goodyear Tire & Rubber Company" by Norman Beasley. It is devoted to the tire industry as portrayed in the activities of Frank Seiberling and PAUL W. LITCHFIELD '96.

In the News

¶ RUSSELL W. PORTER '96 and Dr. John A. Anderson, for building, at the Mt. Wilson Observatory in California, a gigantic burning glass of 19 lenses, each two feet in diameter and also 19 smaller ones, through which they were able to concentrate the energy of the sun's rays to obtain a temperature of 10,000° F.

¶ WALDO H. COMINS '02, General Manager of the National Safety Council, by having his picture and a biography of his life published in the April, 1932, issue of the *Explosives Engineer*.

¶ EDWIN D. MARTIN '22, for being selected by the late Thomas A. Edison to plan and build the Emark Battery Corporation, as an addition to the Edison Industries. An account of this corporation, of which Mr. Martin is now Vice-President and General Manager, appeared in the February, 1932, issue of *Factory and Industrial Management*.

¶ The *Popular Science Monthly* Committee for awarding the $10,000 annual prize for notable scientific achievement. It includes the following Technology men: FRANK B. JEWETT '03, Chairman; CHARLES G. ABBOT '94, GEORGE K. BURGESS '96, KARL T. COMPTON, President of the Institute, ARTHUR D. LITTLE '85, and WILLIS R. WHITNEY '90.

Deaths

Reports have come to The Review since its last issue of the decease of the following:

¶ FRANK P. PEARSON '69, on March 11, 1932, at Pasadena, Calif.

¶ GEORGE H. BERGE '85, on March 2, 1932, at his home in Brookline.

¶ CLARENCE W. SMITH '88, on September 24, 1931.

¶ WILLIAM S. RICHARDSON '95, the spring of 1931, at Rome.

¶ WILLIAM C. MASON '96, on February 14, 1932. (See '96 class notes for further details.)

¶ CAUSTEN B. MAYNADIER '96, on May 9, 1931.

¶ ARTHUR A. MORRICE '96, on December 19, 1931.

¶ ALLAN B. SOUTHER '96, on May 19, 1931.

¶ GEORGE H. BOECK '98, on August 11, 1931.

¶ HARRISON NESBIT '98, on October 21, 1931.

¶ ELZEAR J. PROULX '01, on December 4, 1930.

¶ RICHARD H. STRESAU '04, on January 13, 1932, at Milwaukee.

¶ HENRY L. DEAN '05, on February 16, 1932, in Brooklyn, N. Y.

¶ CHARLES E. JOHNSON '06, on February 29, 1932, at Belmont, Mass.

¶ GEORGE D. LUTHER '07, on February 9, 1932, at Chicago. (See '07 class notes for further details.)

¶ CHALMERS S. CLAPP '08, on August 19, 1931, at Abington, Mass.

¶ DAVID L. JACOBSON '16, on March 6, 1932.

¶ CAROL L. STONE '21, on January 5, 1932, at Bisbee, Ariz. (See '21 class notes for further details.)

¶ The Review hastens to announce that an error was made last month in recording the deaths of NORMAN F. RUTHERFORD '95 and EDWIN W. SOUTHWORTH, JR. '26. In behalf of the Class Secretaries who submitted notes recording these supposed deaths, and in behalf of The Review, an apology is made to both gentlemen, they being very much alive and healthy.

NEWS FROM THE CLASSES AND CLUBS

1875

The fiftieth consecutive meeting of the Class of '75 was held at the Engineers Club on the evening of March 12. Those present were Hibbard, Dorr, Eddy, and Homer. Letters were received from Pierce, New Haven; Lyman, Northampton; Abbott, San Francisco; Bush, Orlando, Fla.; and Prentiss, Wilbur-by-the-Sea, Fla.

Resolutions were prepared and adopted on the death of our late lamented Secretary-Treasurer, Henry L. J. Warren. Warren died suddenly as the result of a shock while at the Brooks Hospital in Brookline, February 10, 1932. Funeral services were held in the Chapel of Mount Auburn Cemetery on Friday, February 12, and were attended by several members of Warren's class, who were much gratified by the presence of Professor Charles E. Locke '96 and J. Rhyne Killian, Jr. '26 representing the Alumni Association and by their beautiful floral tribute.

Homer was elected Secretary-Treasurer in Warren's stead. — JOSEPH W. HOMER, *Secretary*, 38 Webster Place, Brookline, Mass.

1884

Those of us in Metropolitan Boston had a get-together lunch at the University Club in early December, with Dearborn, Doane, Fitch, Prescott, Stuart, and Gill in attendance. All seemed spry and in good spirits, notwithstanding our combined age totaled 422 years. Some of us even remembered the famous notice, "Smoking on the front steps is hereby forbidden — John M. Ordway, Chairman of the Faculty." I wonder what would have happened had the students smoked before and after lectures, in the lecture rooms, and everywhere else. The Class seems to be making a record for keeping out of the newspapers.

Bardwell spent a portion of last winter in Florida and is now at his home in Northfield, Minn. — Carven is acting Commissioner of Public Works of Boston vice Louis K. Rourke '95 who is with the Schoolhouse Commission. — Lull underwent a serious operation in July, 1930, from which he has made an excellent recovery. The Class extend sympathy to him in the recent loss of his wife in January.

Stuart, after his retirement from the Massachusetts Highway Commission, spent last summer in Europe with a daughter. — The Secretary hears that Tyler is planning another trip to Europe this summer; he apparently did not listen in vain to the stories which the notable Daniel Pratt, "the Great American Traveler," used to tell us. — AUGUSTUS H. GILL, *Secretary*, Room 4-053, M. I. T., Cambridge, Mass.

1888

The marriage of Miss Anne Colston Minor, daughter of Mr. and Mrs. John B. Minor of Richmond, Va., to Whitney Stone, son of Mr. and Mrs. Charles A. Stone of 907 Fifth Avenue, New York, and of "Solana," Locust Valley, Long Island, took place at the home of the bride's parents on March 12. Mr. and Mrs. Stone sailed immediately for Europe, and upon their return will make their home in New York. Mr. Stone, a Vice-President of Stone and Webster, Inc., was graduated from St. Paul's School and Harvard University, Class of '30. The bride was graduated from St. Catherine's School. She is a granddaughter of the late Professor John B. Minor, for 50 years professor of law at the University of Virginia.

The Class of '88 was represented at the Annual Dinner of the Alumni Association at Hotel Statler, Boston, on February 6 by the following: Mr. and Mrs. Webster, Mr. and Mrs. Runkle, Mr. and Mrs. Wood, Horn, Keough, and Sawyer.

In these days of war and rumors of wars it is very comforting to be assured by such an eminent military authority as Major General Henry J. Horn that "the Dutch are still holding Holland."

A Radiogram from Mexico via Java and Concord was decoded by your Secretary as follows: "This afternoon in Mexico, Sunday in San Francisco, and Thursday in Vancouver. Cheerio. John." This is an indication of the time and space annihilation of our classmate, John Runkle, who is now on one of his international tours with Mrs. Runkle. We hope to have some interesting details of their trip in a later issue.

Edwin Richter Pearson of Portsmouth, N. H., writes that he retired from active business some 12 or more years ago, and although statistically a bachelor, the federal government designates him a "head of a family" as he has an aunt 92 years old and a sister under his protection. Pearson was with the General Electric Company at Schenectady and Pittsfield during nearly all of his active engineering career. When he retired, he was at the head of the department of transformer design and undoubtedly the best informed engineer along that line in the country. He obtained a considerable number of patents consigned to the General Electric Company which he believes will always be profitable to them.

Miss Isabel F. Hyams, a great philanthropist, daughter of Solomon M. and Clara C. Hyams, passed away on February 17. She was one of the five co-eds elected to honorary membership in the "Society of '88" during our sophomore year. The Boston *Herald* of February 18 has the following to say in regard to her notable life work. "She was a member of the Class of '88 at Technology. For many years thereafter she was associated with Mrs. Ellen Richards, assistant Professor of Sanitary Chemistry at the Institute, in her laboratory work relating to public health.

"The pioneer effort of Miss Hyams in social and educational work was the Louisa M. Alcott Club, which she founded in 1895 in the south end of Boston. Through clubs and classes for children of all ages, she adapted the principles of home economics to the child's physical development, with extension work into the home for the parents. In 1905 an exhibit of this work at the Fifth International Congress in Washington was given a special medal. These lessons in domestic science were a forerunner of the movement known today as health education. In connection with the Louisa M. Alcott Club, Miss Hyams, until within a few years, also conducted during the summer months the Orchard House at Hingham as a vacation home for children of the club.

"For many years Miss Hyams had been a benefactor and prime mover in activities relating to tuberculosis. She was a trustee of the Boston Sanatorium in Mattapan and a member of the special committee of the out-patient department until the sanatorium was taken over by the Boston City Hospital. In this connection she was primarily responsible for the opening of the first outdoor school in Boston at Franklin Park. Miss Hyams was for 27 years clerk of the Boston Tuberculosis Association and was a leader in the establishment by that association of the Prendergast Preventorium for Children at Mattapan and, more recently, of the Sheltered Workshop for discharged tuberculosis patients who are unable immediately to engage in industrial occupations under competitive conditions.

"Miss Hyams and her sister, Miss Sarah A. Hyams, have had charge of the disbursement for charitable purposes of the income of a large fund established by their brother, Godfrey M. Hyams. Miss Hyams gave her entire life to the promotion of work for the young, the needy, the sick, and the unfortunate. In selecting the objects for which she worked and gave, she looked only to the results which might be accomplished and made no discriminations of race, color, or creed."

Still another of our classmates has passed away — Clarence W. Smith, on September 24, 1931. Although Smith graduated in chemistry, he followed steam engineering practically all his life, making a specialty of a patent boiler setting, smoke-preventer, and mechanical draft. About the first of April, 1931, he was confined to his home, and in June went to a hospital for treatment. Smith

1888 Continued

was a bachelor, his nearest relatives being some cousins.

Another article from the fluent pen of our illustrious classmate, Miss Marion Talbot, former Dean of Women in the University of Chicago, appeared in a recent issue of the *Journal* of the American Association of University Women. It is entitled "Changing Education in a Changing World."

President Alfred H. Sawyer was elected '88 Class Representative on the Alumni Council on April 20, to fill the vacancy caused by the resignation of John C. Runkle who spends most of his time traveling over these United States and many other foreign countries. — BERTRAND R. T. COLLINS, *Secretary*, 18 Athelstane Road, Newton Centre, Mass.

1890

At the Alumni Dinner held at Hotel Statler, February 6, the following were present from our Class: Batchelder, DeWolf, Gilmore, Rogers, Roots, and Sherman; and in addition with their ladies were Burley, Goodwin, Kendall, and Packard. An enjoyable evening was spent in reminiscing over old days.

Among the box holders at the Skating Carnival given at the Boston Arena, February 27, for the benefit of the Convalescent Home of the Children's Hospital in Wellesley, were Mr. and Mrs. Frederick P. Royce.

At the Alumni Reunion of the English High School of Boston, Charles Hayden of the Class of '86 presented a beautiful bronze statue symbolic of the "Spirit of Service" to the school. The gathering of about 700 Alumni was held in the school Drill Hall, it being the 110th Anniversary of the founding of the school. A message of greeting was sent by President Compton, of M.I.T., and a letter was sent from President Hoover. Charlie was introduced as "a self-made man, who is on more Boards of Directors than any other man in the country."

The Alumni office advises us that Edward H. Wood who was with us our Freshman year is now a resident of Stoneham, Mass. He has traveled a great deal all over the country, but this is the first word we ever received of him. — The latest address we have for Elwood A. Emery is 128 B Street, N.E., Washington, D. C. — William B. Poland's New York address is 7 Gracie Square. Billy was at the Tech Dinner in New York in January, and this is the first address we have had of his whereabouts for some years, as we supposed he was still in the Far East.

The Alumni office has advised us that William B. Wood died on October 30, 1922. Some of you may remember Billy, who was our drum major in the Freshman year. His home was in Arlington, and after leaving Technology he went into his father's business on ice machinery. Some 25 years ago he moved to New York state, where he conducted the same business.

We have just learned that Douglas Flood has gone into the Consular Service, and has been appointed to Ottawa, Canada. Whether this is our "Dougy," or his son, or no relation at all, we have not heard, but mention it for what it is worth.

Your Secretary and Mrs. Gilmore left on March 10 for a trip to Mexico, to be gone four or five weeks. At the last moment Mrs. H. M. Goodwin joined your Secretary and Mrs. Gilmore on this trip. It took us four nights by train from Boston. We had a most delightful week in Mexico City with a hundred mile ride over the mountains down to Puebla where we visited old cathedrals which were most interesting. We also spent a day in Guadaloupe and saw the 8,000-year-old pyramids. Then we went on to Cuernavaca, traveling over most perfect, smooth auto roads. If any of you plan a trip to Mexico, get in touch with your Secretary. — GEORGE A. GILMORE, *Secretary*, 57 Hancock Street, Lexington, Mass.

1892

The Fortieth Reunion of the Class will be held on the week-end beginning June 3, and full particulars have been sent to all the members of the Class who are on the mailing list. If this should come to the notice of any member who has not received his copy, please let me know at once. — JOHN W. HALL, *Secretary*, 8 Hillside Street, Roxbury, Mass.

1895

The announcement in the March edition of The Review, of the death of Norman F. Rutherford in Dover, N. J., during October last year, is incorrect. We are glad to learn through a letter from Frank C. Schmitz, of New York City, that Rutherford is very much alive. Frank is one of the faithful readers of The Review and we are indebted to him for this correction. This error is to be regretted, occurring through a confusion of the name Rutherford in a clipping from the New York *Times*.

We are advised by the Alumni Association office that William S. Richardson, '95, formerly with McKim, Mead & White of New York City, died in the spring of last year.

This is all! Spring is here. Let us not be down-hearted. Tell the other fellow what you are thinking about; it will brace him up for better times. — LUTHER K. YODER, *Secretary*, Chandler Machine Company, Ayer, Mass. JOHN H. GARDINER, *Assistant Secretary*, Graybar Electric Company, 420 Lexington Avenue, New York, N. Y.

1896

Spring trips have been underway. Joe Driscoll made his annual visit to Pinehurst, N. C., to begin his golf season, and get himself in shape to take on Fred Damon and John Rockwell as soon as the season opens around Boston. This year he left Mrs. Driscoll behind in their new house in Brookline so that she could have a complete rest from the care of him. — Gene Hultman, with Mrs. Hultman, sailed on March 3 for an 18-day trip to the Caribbean on the Cunard-Anchor liner *California*. He returned much rested, and was officially escorted up Boston harbor by the police boats. — John Rockwell left March 23 for two days at Bloomington, Ind., where, as a member of the Wrestling Rules Committee of the National Collegiate Athletic Association, he settled all wrestling problems for the coming year. His plan was to see something of Wayne in Indianapolis en route. — Paul Litchfield called upon the Secretary on March 19, while he was spending the day in Boston on business connected with the Goodyear Company. Paul is well, happy, and busy.

Bradley Stoughton, at Lehigh University, sends along word that he has no news of special interest, but that he is especially busy just now building a house out in the country and this, with his teaching work and consulting work for the Baldwin Locomotive Works and its subsidiary, the Standard Steel Works, gives him all he can do.

Norman Rutherford, whose death had been reported, informs the Secretary that he is very much alive. He is now located in New York State and hopes to defer for many years yet the date when his obituary can really be written.

Dr. Allan Winter Rowe has graciously acknowledged the annual '96 contribution of fifty dollars for Technology athletics and especially asked that his sincere appreciation of our generosity be broadcast to each classmate. — Charlie Lawrence has written that he saw quite a bit of Lindenlaub's son and brother around New York, and has also heard from Armin himself in Germany.

Eddie Mansfield is happy over the complete recovery of his daughter from her serious automobile accident last summer. She is now studying at the Walnut Hill School in Natick and expects to enter college in the fall. Eddie has always been a very warm admirer of Thomas A. Edison and when the latter passed away Eddie was inspired to write some verses of appreciation which appeared in "Edison Life." These were so expressive that classmates are recommended to write to Eddie for them. It is a matter of great regret that the rules of The Review will not allow their reproduction here.

Dr. Compton recently informed the Secretary that he had seen Burgess in Washington when he attended a committee meeting where Burgess presided. George had apparently lost a little flesh, but had made splendid recovery from his recent illness.

Deaths of four classmates have occurred: Causten B. Maynadier May 9, 1931; Allan B. Souther May 19, 1931; Arthur A. Morrice December 19, 1931; and William C. Mason February 14, 1932. Further details are not yet available for Maynadier, Souther, and Mason, but will be obtained for a later issue. Morrice will be remembered as a man who was with us for three years in Course VI. He was born April 7, 1873, in Montreal, the son of David and Annie (Mather) Morrice. His father was one of Canada's very rich men, and the family were large owners in the cotton industry of Canada. They still

1896 Continued

largely control the Dominion Textile Company. Arthur was a director of the Dominion Cotton Company at the time of his death, but had retired from business in 1916, after spending 24 active years with Canadian Cottons, Ltd., as Director and Manager of the Ontario Department. For a number of years past he had been in poor health, and more recently his lungs were not in good shape, so that his winters were spent either in Switzerland or in the south. At the time of his death he was on his way to Switzerland for the winter as he preferred the doctor there, but he was seized with his last illness while on the steamer, and was taken off on a stretcher when the steamer docked at Plymouth, where he passed away some days later. Burial was in Montreal. Morrice married Florence E. Rousseaux in Hamilton in 1900 and there were two children, F. Eleanor born in 1901 and David born in 1903. Mrs. Morrice was with him at the time of his death. Arthur was a quiet, lovable fellow whom we all admired.

Here is the next chapter of the Fuller travelogue: "Our last stop on the Gold Coast was at Accra, at which, although a city of nearly 30,000 people, we had to land in canoes in the surf, through which we were carried to the beach in chairs borne by half a dozen bronzed negroes.

"While at anchor a cuttle-fish, considered a great delicacy by the natives, was seen alongside, and in a flash a dozen of the negro ship boys were overboard, capturing it with bare hands. On a neighboring steamer, unloading Indian bullocks, a struggling animal being lowered by its horns landed a kick at one of the boys which sent him in somersaults through the air to the water 30 feet below. Coming to the surface and lacking adequate swear words, he shook his fist angrily, crying to the swinging steer, 'You're no good, you're no good!' Another bullock, stampeding in a canoe, swamped it, throwing ten boys into the sea. We sent a launch and rescued the latter, but the bullock was drowned. The boys expected a feast from the carcass, but the authorities poured oil on it and burned it, doubtless to discourage similar 'accidents' which presumably would become frequent if the boys got the meat.

"Leaving the Gold Coast we passed on to the Slave Coast, as the shores of Togoland, formerly German but now a French mandate, and the French colony at Dahomey are called, from the enormous number of slaves formerly taken from here. Over 19,000 a year were carried from the Gold Coast and still greater numbers from the Slave Coast, a large share of them to America in the days before the Civil War.

"The natives of Dahomey were elaborately organized and crudely civilized before the coming of the whites, although steeped with cruel superstitions and savagery. Their 'customs' or spectacular celebrations, at which hundreds of victims were sacrificed, horrified the world. Sir Richard Burton, translator of the unexpurgated 'Arabian Nights' was sent by England to stop them but failed. The Amazon army, maintained by the old kings, was a constant terror to all neighboring tribes, because of their fiercely reckless fighting. Our next stop is Lagos in British Nigeria." — CHARLES E. LOCKE, *Secretary*, Room 8-109, M. I. T., Cambridge, Mass. JOHN A. ROCKWELL, *Assistant Secretary*, 24 Garden Street, Cambridge, Mass.

1898

Van Lansingh dropped in a few days ago. Van has been interested in molybdenum, tungsten, and such metals for a number of years and until recently has been President of the York Metal and Alloys Company of York, Pa. This company has combined with other companies in similar lines and is now the Molybdenum Corporation of America with headquarters at 500 Fifth Avenue, New York. Van reports a profitable business in spite of the times. The addition of a little molybdenum vastly improves the quality of cast iron, so that molybdenum cast iron is now being used for brake drums on the high grade automobiles. Another interesting product he is making is calcium boride for use as a deoxidizing and degasifying agent in metal castings.

We have a copy of the San Diego *Union* of January 27 with a picture of Everett N. Curtis in judicial robes presiding in court to which he has recently been appointed Justice. — Edward Bridge Richardson is active in civic affairs in the town of Brookline, Mass. He has recently made a run for School Committee.

We clipped from the Boston *Transcript* of February 20 Roger Babson's usual Saturday contribution of financial wisdom because we thought it was unusually sound. It was entitled "Hoard Securities and Goods, Not Currency." The following paragraph gives the gist of his argument.

"If a sufficient number of people had begun this kind of hoarding before the boom got out of hand, they would have greatly lessened the present depression. In the same way, if sufficient people would now start to gather in and hoard good, under-priced stocks, bonds and commodities, they would greatly hasten the recovery. Also, remember that the basis of most great fortunes was laid by the proper kind of hoarding at the proper time. As prices rise in the next recovery, currency will become less and less valuable, whereas good securities, raw materials, iron and steel, and clothing, will be worth more and more. Not only does hoarded currency bring in no interest, but with rising prices it depreciates in principal. Some day those who are stuffing their safe deposit boxes with cash will wake up to find the value of the cash has shrunk. Meantime, the value of the things they might have bought will have risen."

George Cottle has recently returned from a trip to Florida. Next week he goes to Haiti. Some traveler! George has just been elected to the Alumni Council as Representative-at-Large. — Joe Riley has been elected Class Representative, succeeding Elliott Barker who has had the office for 15 years.

A year from this spring is our Thirty-fifth Anniversary. Elliott Barker and Roy Peavey have undertaken to make plans for our Reunion. Every member of '98 keep the event in mind and plan to be there. If you have wishes or suggestions, send them to the above committee.

Word has been received of the deaths of Harrison Nesbit of Pittsburgh on October 21, 1931, and George H. Boeck of St. Louis on August 11, 1931. — ARTHUR A. BLANCHARD, *Secretary*, Room 4-160, M. I. T., Cambridge, Mass.

1901

It is with deep regret that I record the death of two members of the Class, Erik Green, in these later years living in Providence, died on April last, and Elzear J. Proulx who died in December 1930. Word of these two losses from our group has but recently reached me. I regret that I have no details.

Anna Gallup, the Curator-in-Chief of the Brooklyn Children's Museum, will represent M. I. T. at the Biennial Conference of the North Atlantic Section of the American Association of University Women. This will be held in Burlington, Vt., during this June.

Al Sulzer, whose appointment as General Manager of Kodak Park Works was announced some time ago in these columns, was recently elected a Director of the Eastman Kodak Company.

Having made these formal announcements I am going to indulge in a little gossip. There is no member of the Class, I am sure, who does not remember the brilliant Thespian triumphs of Jack Scully during his checkered but never dull career at the Institute. Some of us, even in the years that followed, were fortunate enough to see him after he had made his professional début and was giving William Faversham, and other well-known actors in that by-gone day, the benefit of his support. And they him. In fact it was a genuine regret, to those of us who were informed, that Jack relinquished what would certainly have been a brilliant dramatic career to engage in the drab pursuit of business. So it is with a peculiar pleasure that I inform the Class that Jack once more is treading the boards, this time vicariously in the person of a very charming daughter named Ruth who has gathered about her a group of young people and is producing, at irregular intervals, some of the newer offerings in the dramatic field. Jack is apparently enacting himself the several rôles of patron of the arts, property man, and genial critic on the hearth. For one, I hope that the allure of the boards will prove too much and that in time we shall see him in active participation in daughter's triumphs. Looking back through the mist of more than 30 years — this a poetic touch engendered by the theme — I see Jack in his unique performance of Molière's "*L'Avare*" — for the benefit of the illiterate who have forgotten Charlie Bernard I translate this as "The Miser" — but I have lost the thread of my discourse. The mist is probably too much and at that it is French and not Scotch.

1901 Continued

Anyhow some of you will remember it and so I hope will avail yourselves of the opportunity to see John Scully — himself — when he makes his all-star production of "Uncle Tom's Cabin." I have signed up as one of the bloodhounds though the younger generation assures me that I would be better cast as a cake of ice. So nice for Eliza to have a really sympathetic foundation while she bears the child.

Speaking of which, a scion of the house of Philip Wyatt Moore is matriculated and is enjoying his freshman year at Harvard so far as the social limitations of the House Plan permit. I have not seen the young man as yet — Philip speaks highly of him — but I am looking forward to a study of the influence of prenatal and puberal contact of the PRIVATE ROAD on a young man of the present generation.

Again speaking of which, I am planning to visit Chicago in the not far distant future and am now engaged in a series of conferences with Donald MacMillan, Admiral Byrd, and a lad just out of Kenya Colony as to the proper equipment and best method of approach to the icy fastnesses of the PRIVATE ROAD. We may decide, however, to compromise on the Chicago Club.

And speaking of which, in the course of my principal avocational pursuit I plan to visit a number of central and southern cities in the course of the next few months and on these occasions shall have an opportunity to renew acquaintance with classmates, unseen but not forgotten during the past three decades. This is in the nature of a warning which I feel safe in uttering as I am certain that editorial sloth will prevent publication until after my visit. And when I do return, oh, friends, it will be with sheaves of news garnered at the source — Joyce has authorized the use of the mixed metaphor — and for some months thereafter I shall be able to regale you with the low-down on the domestic life of some of your erstwhile friends. With this pleasant promise and no other commitment I assuage the yearning of a sorely tried editor. — ALLAN WINTER ROWE, *Secretary*, 4 Newbury Street, Boston, Mass.

1904

The Annual Reunion of the Class will be held at East Bay Lodge, Osterville, Mass., on June 24, 25, and 26. I hope prosperity is just around the corner and that we may have a goodly representation at the Reunion.

Under date of February 11, I received the following letter from Bill Evans on the stationery of the Auditorium Conditioning Corporation with offices at 39 Cortlandt St., New York City. "The attached clipping from *Power* places something interesting about our classmate Thurlow.

"I should have reported to you the slim attendance of 1904 at the Annual Dinner on January 19. Wilson and I were the only '04 men present. You can, therefore, understand that there was no '04 excitement, although we sat at the table with '03 and '05 you will see that they were not overnumerous, but the attendance at the dinner exactly equalled that of last year.

"What does this stationery mean? Auditorium Conditioning Corporation is a holding company for patents used in air conditioning. On account of my association with Carrier Engineering Corporation for the past three years, I have been put on the job of managing this company associated with Carrier. We control some very important patents that have to do with comfort cooling and places of human assembly.

"The comfort cooling is getting a lot of consideration at the present moment. Many count upon it as the salvation of business in the near future. They expect if to be the means of unloosening a lot of idle money for this latest refinement in living comfort. Let us hope that it does just that thing — loosen up the money."

The clipping to which he refers is as follows and the same information was contained in the transactions of the American Society of Mechanical Engineers for February 22, 1932.

"O. G. Thurlow, Vice-President of the Commonwealth and Southern Corporation, under whose direction most of the large hydro-electric projects in the South were designed and constructed, was honored recently by the Alabama Power Company. In recognition of his service to the state and the power industry, the board of directors of the company voted to designate the Lower Tallassee hydro development as Thurlow Dam."

Under date of March 21, I received the following letter from General Holcombe in Washington.

"Enclosed are two clippings from Professor Locke's office concerning Holbrook and Riddell that you may have heard something about. I assume they were sent to me through oversight.

"You probably have received the announcement of our change of address here occasioned by the transfer of the Patent Office from the old building, the construction of which was started in 1838, to the gigantic new Department of Commerce Building, where it occupies the whole of the northerly wing.

"I have had several letters from classmates, among which is one from Charley Haynes, saying he is now with the Mechanical Goods Department of the United States Rubber Company at Passaic, New Jersey, and living at 405 E. 54th St., New York City, where he is keeping open house to his friends who may be forced to visit the metropolis. He says, Wentworth, Mert Emerson and Cy Ferris were in to see him recently. Reggie I understand is now with Sharp & Dohme, well known manufacturers of fine chemicals and drugs, in Philadelphia.

"I hope you are feeling fit again, and that some fine day you will blow in here with your vacation clothes so I can return some of the hospitality that I have received in Boston in kind."

The address of the General's new office is Munsey Building, 1329 E Street, N.W., Washington, D. C. I hope that sometime in the future I shall be fortunate enough to visit the City of Washington and shall certainly avail myself of the invitation in the last paragraph of his letter and I know that the General will appreciate my passing this invitation along to any other members of the Class who may be in Washington.

The clippings enclosed with the General's letter are as follows:

"Guy C. Riddell has returned to Russia after a month's trip to Vienna, Lausanne, Berlin, and Warsaw, for business and on vacation. He is now consulting engineer to the Rare Metals Trust "Soyuzredmet," with headquarters at Moscow, from which point he inspects and directs rare-metal plants and mines in various parts of the Soviet Union."

"E. A. Holbrook, Dean of the School of Engineering and Mines at the University of Pittsburgh has been elected President of the Coal Mining Institute of America at the meeting in Pittsburgh in January."

I want to give credit to Reg Wentworth for forwarding to me via Mert Emerson the same clippings with reference to Holbrook and Thurlow which are given above.

Phil Sweetser has closed the offices of Sweetser, Coffin and Fuller located in Boston and transferred his activities to Philadelphia where his firm has had a branch office for some time. Apparently the business of the branch office has overshadowed that of the firm's main office in Boston, making it advantageous for Phil to leave this part of the country and take up his residence in Philadelphia. We are all very sorry to see Phil leave this vicinity and on February 26 a small gathering of the faithful held a dinner at the University Club for the purpose of expressing to Phil our regrets. We had a very pleasant evening and were treated to a showing of the Class moving pictures as presented by Tammy Rockwood. This was received with the usual enthusiasm and every presentation is a little longer than the previous one due to the fact that Tammy takes new pictures every year. We all wish Phil great success in his new location.

It again becomes my sad duty to record the passing of another member of the Class, the information coming from a clipping in the issue of *Steel* published on January 25, 1932, at Cleveland, Ohio.

"Richard Stresau, 51, engineer with the A. O. Smith Corp., Milwaukee, died at Milwaukee, January 13. He was noted for his engineering contributions in the electric welding field on couplings, pressure vessels and pipe. Born in Galveston, Texas, he was graduated from Massachusetts Institute of Technology, Boston, in 1904 and first went to work for an uncle engaged in the electrical business in Europe. Later he returned to this country and did some important engineering work for the government during the war. In 1919 he joined the A. O. Smith Corp."

Dick Stresau was one of my most intimate friends during the four years we spent at the Institute, and although I had not seen him for a good many years the notice of his death brings back to me many pleasant memories of hours spent

1904 Continued

with him and John Rapier in their room at 17 Blagden Street. Perhaps these words may bring to others the same memories of that room.

I feel quite satisfied with the amount of news that has come to me for this issue and I hope that I shall have much more for the next issue which will come in the fall.

I earnestly hope that you will all have a very pleasant summer and that when fall rolls around again the depression may be over so that we all may look forward to a much more prosperous and happy winter than the past one may have been for some of us. — HENRY W. STEVENS, *Secretary*, 12 Garrison Street, Chestnut Hill, Mass. AMASA M. HOLCOMBE, *Assistant Secretary*, 3305 18th Street, N.W., Washington, D.C.

1905

It was worth waiting for Jim Barnes' account of his European trip in '31. "With the completion of 1930 business, I finished my professional engagement with the Louisville Railway Company and was pretty well tired, too. One of the little incidental jobs I'd had to do in that last year was to get $6,000,000 for the refunding of First Mortgage bonds and you may recall that it was no mere knife and fork job to borrow millions for a traction proposition in that eventful summer.

"So Mrs. Barnes decided we would go over and spend a few weeks with the 1905 Class Boy. You may remember that James M. graduated from Harvard in 1929 and went to France for a year of language study. He is now and was last Spring at the Sorbonne, in Paris — if you've forgotten its whereabouts — studying for the degree of *Doctorat de l'Université* which is a much more ornamental degree than any his father will ever attain. Forthwith or thereupon or therefore we sailed on April 3rd on a slow (and cheap) boat and lived three golden months on the banks of the Seine, taking good care that we saw both banks of it too. I refused to look with an engineering eye at anything whatever and, believe it or not, we sunk ourselves deep in the beauties of art and music.

"Of course, we saw a bit of the marvelous tennis that decided the French championship and my memories of Chapel were stirred once or more at those delightful sidewalk cafés, but we lived very simply and quietly with the charming French family who had taken young Jim into their circle and we looked out upon the American tourist as the *lusus natura* that he positively is.

"We saw the tulips bloom in Holland and we smelled the hedgerows of England but we had no adventures, settled no international problems, and are writing no books on debt, moratorium or any similar trifle. We may be the only people who have been absent from the port of New York for three months who have not qualified for or done any of these things but such is our record and upon it we must stand. Seriously, I wouldn't have believed that any three months could have held so much physical rejuvenation and spiritual refreshment.

"Since my return I've been looking about a bit at this very interesting time in which we're living. Observing that our environment is rapidly changing through the operation of those twin forces, obsolescence and replacement, I have been examining some of the programs which are their agents. I think it is wiser as well as pleasanter to follow the rising rather than the setting sun in the next phase of experience. Several such programs have interested me and I am now busily engaged on one of them. The Air-Way Electric Appliance Corporation has for its mission in business the improvement of the home from the standpoints of sanitation and convenience. Incidentally to this main purpose the Company has not been unsuccessful in the improvement of the lot of its stockholders.

"I spent two months in Chicago with them and am just now establishing a Division Office for them in Watertown, N. Y., whence are already flowing forth streams of labor-saving, sanitary devices to make Milady Housewife's work easier and her home a better one in which to live."

About now the classes are announcing their reunion locations. It is interesting to note how '05 has led. In 1923, Charlie Boggs found East Bay Lodge which has been popular ever since. In 1925, Charlie discovered The Sippican, in Marion, which has not been popular. It burned down (after we left). For our Twenty-Fifth, Bob Farrington chose the Oyster Harbors Club, until then unaccustomed to reunions. See the classes that are going there this year. Our reunion chairmen have been pioneers.

John Lynch writes from Pottsville, Pa. "My work is still with Stone and Webster. Last year we were busy with some appraisal work in New York and I am now located in Pennsylvania for a while. The work here is in connection with the design for breaker and cleaner plants for the Coal Company. In the past few years our work has been quite diversified, consisting of design and construction of industrial plants and power stations. In this connection I have moved around considerably in the East, making stays at Baltimore, Philadelphia, New York, Syracuse, Washington, and so on, for more or less extended periods."

Frank Langworthy writes from Lynn that he has been a clerk in the post office since 1905 and that his hobby is stamp collecting. He says: "I take much pleasure in reading The Review and also paying class dues. (Do I owe anything?) (No!, Sec.) The only one of the '05 boys I ever see is Frank Elliott who is in the printing business in Lynn."

Sam Shapira is back from Russia with 1945 Commonwealth Ave., Boston, as the present address. — Tech swam Wesleyan on March 5 and lost. But one Beaver made a new 440 record. — Carl Graesser was married on March 2 to Miss Betty Lillian Warner of Greenwich, Conn. — A picture of Massachusetts golf officials, without Harry Wentworth, got into the Boston *Herald*. Has he fallen for badminton? — Hot off the press. "Phosphate Rock in 1930" by Bertrand L. Johnson. — A letter from Jim Whitmore, Bloomfield, N. J., brought no news, only dues. — Western clippings prove that President Charlie Clapp is still talking. — Capt. Ross P. Schlabach is back at the Boston Navy Yard.

William Seward Mann wrote from San Bernardino, Calif., in February: "I believe it was Bob Adams you wrote about. I have lost your letter but just came across your envelope while trying to 'pull in' Japan on a short wave set so am answering in the 'wee sma hours' to the plaintive call of the 'Back Seat Driver.'

"No, I never knowingly came across our mutual friend either at Redding or anywhere in the north. I was in that Division (II) from 1928 to April, 1931, when I was transferred to this extreme southern Division (VIII). During this last summer I had charge of Asphalt street work on a six-mile job from the Silvery Colorado (Yuma, Ariz.) to a point 5.95 miles west. A temperature of 127 was common but one day it went to 135 and six Yuma Indians on the street and three at the Plant 'passed out' but I managed to keep moving, although I was in no condition for much violent exercise. By the way I don't believe the person who wrote about the Silvery Colorado ever saw, because the Wonderful Silvery Colorado is the color of red clay all the year around.

"The road on which I am working now is U. S. No. 66 — National Old Trails Road, Los Angeles-New York via Salt Lake. We are about 50 miles southwest of Victorville and 68 miles east of Los Angeles. Our recreation here consists of bridge work — sometimes cards, sometimes concrete, occasionally, weather permitting, golf but at the present time we have a foot of snow and for the past two weeks we have had continuous rain, land slides and traffic troubles to contend with."

Charlie Hawkes' secretary writes that the letter from Mrs. Bob Adams gave her courage "to send along my contribution regarding Charlie Hawkes and the Sampson and Murdock Co." (Charles!) At the National Direct Advertising Convention in October, 1931, the Sampson and Murdock Co., was awarded first prize for the best exhibit of processed letter work. Charlie got the prize for the best direct advertising campaign in 1929 and 1930 and just missed permanent possession in 1931.

Raymond Bell, who occasionally drives through Middletown but, as yet, hasn't stopped, wrote a letter of apology for passing us by around Christmas and promising to do better next time. He added, "While business has been bad around the country, we have managed to keep up in pretty good shape. About two months ago we entered a new form of engineering — that of managing a business. We made a contract to take over the management of a manufacturing concern in Chicago for a period of three years. We have had in mind doing something of this sort for some time and may extend our activities along this line."

1905 Continued

From Charlie Boggs: "I do not know what I will do regarding the Bermuda Race. I have been asked, but since I am so much older that you are, I doubt whether I am young enough to participate in another one of them. I believe I could live through it and enjoy Bermuda, but I am not so sure I am young enough to make a good member of the crew." He'll be at the starting line in June.

Bob Luce wrote in February: "Have been here in Boston now for the past four years, as inspector in charge of the Coast and Geodetic Survey's New England district. Have met quite a few members of our class during this time and especially at the reunion. While in this section I have been living at 78 Oakley Road, Belmont, and while here my family has been increased by the addition of a son, Robert James, now 2½ years old, who hasn't, I believe, been chronicled in the news of the Class.

"Just recently I have been advised that I am to be detached from duty here in Boston about the end of March; and after a short assignment in our Washington, D. C., office, will leave for the Philippines about the latter part of May, to take up the duties of Director of Coast Surveys at Manila, in charge of the work this service is doing in the Philippine Islands. My address in Manila will be Director of Coast Surveys, Intendencia Building, Manila.

"While I have enjoyed my stay here in Boston very much, I am looking forward — as all good service people have the habit of doing — to a very pleasant assignment in Manila; at least I expect to get out of shoveling snow for a while."

From Professor Gill, through the alumni office, comes the news of the death of Henry Lawrence Dean, XIII, on February 16 in Brooklyn, N. Y. Dean will be remembered for his playing on the class football and baseball teams. He had been out of touch with this office for some years. An effort is being made to secure the material for an obituary. — ROSWELL DAVIS, *Secretary*, Wes. Station, Middletown, Conn. SIDNEY T. STRICKLAND, *Assistant Secretary*, 20 Newbury Street, Boston, Mass.

1906

The Secretary regrets his failure to attend the Annual Alumni Banquet held on February 6. We are advised by Charlie Kasson, who is probably the most faithful member of the Class with respect to such affairs, that there were six '06's present counting two classmates by marriage. Those present were: W. G. Abbott, C. L. Kasson, Eleanor Manning O'Connor and Professor O'Connor, and H. R. Philbrick and Mrs. Philbrick. Credit should be given Abbott for coming from Wilton, N. H., and to the Philbricks for coming all the way from Hartford. The Secretary deplores that the Boston crowd did not turn out in greater numbers. Particularly, where two of our members took the trouble to travel 150 miles or so, it seems as if some of us should have been able to have gone four or five miles to the party. However, as the writer did not set a very good example, that's that, and we will try to do better next year.

We are indebted to our Douglass Hill, Maine, correspondent — Mrs. Dennison's little boy Orville (11) for another reference to Dr. Fogg whom we referred to in our last notes. The reference was a clipping from a Portland paper in connection with the old joke about the pan-handler. In spite of the scarcity of class notes I hesitate to repeat it here. If, however, there are any who have not heard it, I will be very glad to submit it upon request.

The following is taken from the St. Louis (Mo.) *Times* of January 13, 1932. Richardson was one of the Naval Constructors who is on our Class list. "Aviation isn't quite old enough to have grand army sitting in a chair by the fire and manipulating an imaginary 'stick' for the grandchildren, but when that time comes, Capt. Holden C. Richardson will have an attentive audience. It is Captain Richardson who is developing the new steam-powered airplane, at Cleveland, and it is this same Captain Richardson who, clinging to a stalled plane, was banged about by 30-foot waves for three days, out on the Atlantic.

"That was in 1919 when Captain Richardson and his mates were jockeying the big, top-heavy NC-3 overseas. That was something like riding a laundry wagon, with a couple of rods of board sidewalk for wings — compared with modern planes, of course. The captain was assistant pilot. Lost in the fog, this side of Portugal, they couldn't radio their location because swarming ships, looking for them, filled the air with their clamor. They drained the radiator for something to drink, took strychnine to keep awake and tooled their creaking hulk up and down in the trough of giant waves. The fog lifted, they taxied into ship range and here's Captain Richardson directing the Great Lakes Aircraft Corporation of Cleveland and, no doubt, enjoying a good book by the fire. From Shamokin, Pa., he went to Annapolis and Boston Tech and became one of the best aircraft designers and most courageous flyers in the navy."

It is with regret that we report the death of another classmate, namely, that of C. E. Johnson, II — who passed away February 29. Johnson had followed engineering since graduation and for a long time was with Meade, Morrison and Co. in East Boston. In recent years he had been doing structural engineering with a concern in Boston. — JAMES W. KIDDER, *Secretary*, Room 505, 261 Franklin Street, Boston, Mass. EDWARD B. ROWE, *Assistant Secretary*, 11 Cushing Road, Wellesley Hills, Mass.

1907

We have received notice of the death of another of our classmates, George D. Luther, Course III, on February 9, 1932. George was connected with the Electric Storage Battery Company for over 20 years, as salesman in Boston, manager in Denver, and manager in Seattle. More recently he had been National Executive Secretary for Sigma Chi Fraternity, with office at 14 East Jackson Boulevard, Chicago. We have written to this office requesting more facts about his activities and his death, and will hope to have this for the next issue of The Review. George had married but had been divorced, and according to our records had one son, William T. Luther, born July 8, 1911.

John P. Chadwick writes that his plans to come back home for a vacation this year have been upset. Times are rather hard for the American Smelting and Refining Company to send him, and furthermore he is now the only man on the job for the Company in Chile and it is hard for him to get away. The item of exchange is one which seriously affects men now working in foreign countries and contemplating a vacation in the United States, because the currency of many countries is now at such a low rate of exchange that a trip home costs much more than in normal times. Fortunately, there is excellent fishing for Chad within a relatively short distance of Santiago (Chile), and furthermore his baby is an added attraction to keep him content at home.

Do you ever listen to the musical program on Station WNAC (Boston) at 5:45 (Eastern Standard Time) on Tuesday evenings? This is sponsored by the Riverside Boiler Works of Cambridge, Mass., of which our classmate, John S. Nicholl, is President and Treasurer. The music is furnished by one of the best dance orchestras in Boston.

We have received a very interesting booklet entitled "The Leavell Commissary Plan in Operation in Tulsa, Oklahoma" and we discover that the man responsible is none other than our own John H. (Stud) Leavell. There is too much material in the 15-page, closely printed folder to publish much of it in these notes, but it strikes us as being of sufficient interest to the Class, and of sufficient importance in these times of unemployment to warrant somewhat lengthy comment. First of all, the following is quoted from a New York paper of December, 1931: "Feeding Needy for 6¢ a Day. American managerial genius has been making quiet, unheralded triumphs throughout this gloomy, red ink year, which is drawing to a close.

"Every situation, however unsatisfactory, creates opportunities for men of surpassing capacity. Out in Tulsa, Okla., for example, Major John H. Leavell, engineer, has introduced modern scientific and business principles into the community task of taking care of the destitute unemployed. With the dietary coöperation of the local medical association, Major Leavell has been giving the poor dietetically correct rations at a daily cost of 6¢ per day per person.

"In Tulsa, a week's supply of food is given out to the needy in a sack on an order from an authorized social agency. In other places, the Major feels, where money is given, the needy frequently buy unwisely.

1907 Continued

"Major Leavell estimates that if the charitable agencies all over the country could follow mass buying and scientific methods, they could save a couple of hundred million dollars this winter."

The folder, prepared in February, 1932, sets forth the fact that John is chairman of a Central Committee of Five, chosen to coördinate all the charitable agencies of Tulsa, having as its purpose the elimination of duplications, the establishment of a uniform system, and the securing of a "greater return for the charity dollar."

"This plan is merely the application of engineering methods to a social problem. While it is impossible to estimate the indirect savings in the prevention of sickness and low morale resulting from malnutrition, the direct savings in money amount to approximately 60% over the amount which has previously been spent, where an equal value of relief was given.

"The Commissary, at the present time, is supplying foodstuffs to approximately 10,000 people. The adult ration, fully balanced, contains approximately 2,800 calories, and is supplied to the clients of the charitable agencies at a cost of 6¢ per person per day.

"The Commissary is no longer an experiment, as it has been in operation since November, 1931, and while not operated for profit, has actually shown a slight profit. At the present time, we have less than 5% of complaints from recipients."

John writes: "I devised the LEAVELL COMMISSARY PLAN, which is based upon a combination of the following ideas. None of these ideas are individually novel.

1. "Purchase of commodities in carload lots for cash.

2. "Making the rations up in unit lots in advance for quick and economical delivery.

3. "Making a uniform weekly ration for the Child, the Adolescent, and the Adult, but varying the component parts in each of these rations so that both its combined analysis and quantity is perfectly adapted dietetically, according to the best medical knowledge, respectively, to the Child, the Adolescent and the Adult, and containing every element necessary in its proper proportion for each of the three ages.

4. "A combination of foods in the ration which have the qualifications to give the results previously mentioned, but which are individually the least expensive for the purpose it serves, in the commodity market of the week in which the ration is issued.

5. "A demonstration of cooking, where the ration is issued, simple methods of preparing the component parts of the ration into a palatable, easily digested, table food with all types of equipment. Explanations are given as to the reason for the inclusion of each of the component parts of the ration for the various ages, in order that each age may receive the foods intended for it and that this food will be properly cooked.

6. "A Health Department is maintained, consisting of a trained Public Health Nurse and an Assistant. They contact the charity seekers, make up special rations for the sick and aged, suggest food formulas for infants under the direction of the Public Health Clinic, and give individual health talks to the charity seekers, and in groups to case workers, with especial emphasis upon deficiency diseases. The nurse also alters rations for the sick, particularly those suffering from deficiency diseases and tuberculosis, and directs other types of sickness to the Public Health Clinic before a critical stage is reached. This nurse keeps records of the children of index families showing the gain in weight, general health, and grades in school, as a practical test of the efficiency of the ration. Although the records have not been kept for a long enough period, nor do they cover enough cases to form absolute conclusions, they do indicate a marked improvement in health, vigor and morale of the recipients."

The folder draws this conclusion: "It is a rare occurrence that an advancement in Social Service moves in the direction of greater economy.

"The LEAVELL COMMISSARY PLAN is an entirely new departure in social service. It is sound in principle and is placing our charity seekers in better health than the average of the citizens, for less money than his mere existence has cost charity in the past.

"Under present commodity prices, when economy is an important consideration, no charitable or penal institution is justified in expending for uncooked food more than 10¢ per day per person to maintain vigorous health."

Remember the Twenty-fifth Reunion — Oyster Harbors Club, Osterville, Mass., June 17–19. We are frequently receiving word from various men indicating their intention of attending. It looks as though this would be the biggest ever for old '07. Let's beat the registration of 81 that '06 had in 1931. In May, we shall send you complete announcement with opportunity for reply. — BRYANT NICHOLS, *Secretary*, 19 Rowe Street, Auburndale, Mass. HAROLD S. WONSON, *Assistant Secretary*, Commonwealth Shoe and Leather Company, Whitman, Mass.

1908

The final get-together of the 1931–32 Season will be held Tuesday evening, May 17, at Walker Memorial. Dinner will be served at 6:30 P. M. — As you know, we celebrate our Twenty-Fifth next year and there are lots of things to talk over and arrange. Please be sure to attend the meeting on May 17. We want your ideas.

We have only recently learned of the death of Chalmers S. Clapp on August 19, 1931 at his home in Abington, Mass. Mr. Clapp was associated with Cram and Ferguson, well-known Boston architects, and had specialized on work in connection with the Cathedral of St. John the Divine in New York City.

Richard Collins, who has been connected for some time with the American Woolen Company, has recently become Production Superintendent for the Arlington Mills, at Lawrence. — George Belcher, who for some time was connected with the International Shoe Company at Manchester, N. H., is now located in Boston and is connected with the United Shoe Machinery Corporation, 140 Federal Street.

Your Secretary, when recently passing through New York state, looked up and visited a while with Walter Hudson at Utica and Bill Barton at Albany. Hudson is Secretary of the Utica Chamber of Commerce and right at present finds plenty to do relieving the local unemployment situation. Barton is with the New York Telephone Company as general commercial engineer, a job which apparently doesn't allow many spare moments.— HAROLD L. CARTER, *Secretary*, 185 Franklin St., Boston, Mass.

1909

The following letter has been received from Ira W. Wolfner in response to the Secretary's inquiry regarding his activities. Such letters are always interesting, and the Secretary would greatly appreciate receiving similar letters from other members of the Class.

"I have, ever since leaving the Institute, been connected with the National Cooperage and Woodenware Company, of Peoria, Ill., which manufactures barrels and kegs for all sorts of liquid products. This Company was founded by my father and two of my uncles, who have since passed away, and is now being operated by one of my cousins and myself, I being at the present time Vice-President of the Company.

"Since the passage of the Eighteenth Amendment in 1918, the barrel business has been rather tough sledding. However, the growth of the chemical industries and the milk and syrup industries have helped somewhat and we have managed to get along.

"I was married in 1914 and divorced in 1925, and have three children. My eldest daughter, Jane, aged 18, has shown a marked talent for drawing, and is at present studying art in Chicago, with the intention of becoming an illustrator. My son, William F. Wolfner, aged 16, is a student at North Western Military and Naval Academy at Lake Geneva, Wis. My youngest daughter, Gertrude, aged 8, is living at home with me, and I am at the present time unmarried.

"Circumstances in the past ten years have made it impossible for me to attend any of the Class Reunions. However, I am hoping that if we get out from under this present business depression I will be able to come East and see some of the boys again."

Paul Wiswall has just returned from a two weeks' visit at Bermuda and writes: "At the place where I stopped was George H. Ingraham '92, who graduated in Course IV, and who has been in Cleveland for many years. We compared notes and thought the Institute was very much on the up and up.

"Bermuda is a tight little island and the old families of English origin are very proud of their heritage. I found that

1909 Continued

a member of the Bermuda Parliament from Hamilton Parish, where I spent most of my time, has a son-in-law, a recent Tech graduate in Course X, who was making perfume from the Bermuda Easter lilies by an extremely interesting process such as is used in Southern France. I am trying to identify young Mr. Scott from the Alumni Register, and, while his address is not given in Bermuda, I feel sure he is Arthur K. Scott, 1929."

Kenneth F. Trimingham is listed in the Class Records as living in Bermuda, where Paul believes "his family runs a store where they sell the most beautiful English woolens." Paul, however, did not see him. — CHARLES R. MAIN, *Secretary*, 201 Devonshire Street, Boston, Mass. PAUL M. WISWALL, *Assistant Secretary*, General Foods Corporation, 250 Park Avenue, New York, N. Y. MAURICE R. SCHARFF, *Assistant Secretary*, 1 Wall Street, New York, N. Y.

1910

Jack Babcock sent in a clipping from the *Transcript* about the meeting of the Boston Society of Civil Engineers, the oldest engineering society in the country. Officers for the ensuing year just elected include Ralph W. Horne, President, and Professor J. B. Babcock, Vice-President. Jack writes that Bill Keefe was one of the tellers, but that as only one candidate was named for President and one for Vice-President, Bill didn't have to pull anything raw to get his classmates in.

Allen Gould writes: "Rather than risk putting it off, will scribble a line or two and shoot it to you. I had a pleasant visit with Harry Hale last Friday — first in seven or eight years. He was in Cleveland for the day, developing some Middle West insurance prospects in connection with his Boston brokerage office. I got back in town just in time to have dinner with him and put him on the train. Talked fast, however, and got pretty well caught up on 1910 news from Boston. No great change to report for myself. Seem to keep very busy all the time, mainly finding new markets for our products to offset the depression shrinkage from old customers. The local Tech Club have had me working on an unemployment committee which has accounted for some of my time today. The depression has not unsaddled many of the local Tech men.

"We have very few '10 men here in Cleveland. Tyler Carlisle has always been here and is well known throughout the city for his many civic activities and connections and as Vice-President of Strong, Carlisle and Hammond. Ralph Bowers was with the city for some years off and on, and understand he may come back here. He has been on large filtration and other projects in this country and abroad since graduation. Enfield, VI, has been running different lamp works of the General Electric Company for some years and is now in charge of the Cleveland plants. R. D. McIntire recently came here — still sticking to storage battery activities. Greetings to the Boston crowd." — DUDLEY CLAPP, *Secretary*, 40 Water Street, East Cambridge, Mass.

1911

Spring has sprung as these notes are being composed, but up here at Douglas Hill there is still an eight-inch blanket of snow and winter sports conditions fine. One discouraging feature, however, is the writer's cramp epidemic among Eleveners. We only have one mail a day up here but it's awfully nice to get letters from classmates and 'tis from them that class notes are composed — without them decomposed.

However, here are a few items. Clarence Dow, I, has expanded his business and in addition to the main office and store of his Federal Coffee Company at 171 Federal Street, Boston, he now is successfully operating the Federal Coffee House at 119 Pinckney Street, this latter being by his own modest admission "the best place in Boston."

Tom Killion, III, sent over from Manhattan a suggested Technology emblem to be worn in the buttonhole of the coat lapel, but after a short discussion at a recent meeting, the Alumni Council rejected the idea. — We are proud to have Don Southgate, IV, of Nashville, Tennessee, elected for a two-year term as Representative-at-Large on the Alumni Council.

Alec Yereance, I, now located at 41 South Munn Avenue, East Orange, N. J., writes that he has been transferred from the Capitol City to the Home Office of the Prudential Insurance Company with the modest and simple job of trying to determine just what are the fundamental difficulties and their cause in the mortgage loan business and what can be done to avoid trouble in future investments. He adds that although this seems a strange assignment for a civil engineer, his previous experience in construction field activities, investigations, appraisals, and economics seems to be valuable preparation for the new work.

Eleven's party of fifteen at the Annual Banquet of the Technology Club of New York consisted of the following with their wives: Sam Cornell, XIII, L. P. Ferris, VI, Roy MacPherson, II, Bill Orchard, XI, Dick Ranger, VIII, Nat Seeley, II; and these stags: Dick Gould, XI, Don Stevens, II, and Emmons Whitcomb, II.

Just three words: Write to Dennie! — ORVILLE B. DENISON, *Secretary*, Douglas Inn, Douglas Hill, Maine. JOHN A. HERLIHY, *Assistant Secretary*, 588 Riverside Avenue, Medford, Mass.

1912

When this issue of The Review reaches you, our Twenty-Year Reunion will be just about a month off. You will have to decide soon, whether you want to make the effort to see again the friends who meant so much to you in those now dimly-remembered days of 1912. Time flies, doesn't it?

Several pieces of Reunion publicity have been sent to everyone in the Class, addressed according to the records of the Alumni Association. If you haven't been fully informed as to the place, date, and cost of the Reunion, write at once to "Shep" or "Mac" (addresses below). Arrangements have been made to have a Reunion party at a cost which should be within the reach of everyone. There will be enough different things to do to entertain and interest almost every taste. Those who have achieved dignity, affluence, and a sedate demeanor will be treated accordingly. Those who still have young ideas will find kindred spirits (see Asst. Sec. for room numbers).

We urge you to make it a little easier for those who are giving their time and efforts to arranging this affair by letting us know now of your intention to attend. Our Fifteen-Year Reunion was wrecked at just this point. We aren't going to let anybody wreck this current Reunion. We already have enough classmates who have assured us that they will be there to insure a successful affair. But it will be just that much better, if you sign up a few weeks in advance.

Your Assistant Secretary reports that he has had pleasant visits from R. E. Wilson, II, R. J. Wiseman, VI, Page Golson, VI, and E. L. Lasier, I. Also telephone calls from Ernest Nicholson, I, and J. A. Noyes, II. These men are all intensely interested in the Reunion plans; they hope and expect to attend; and have offered helpful and practical suggestions.

A short note from E. C. Holbrook, I, in far away Manila, expresses his interest in class affairs, and his hope that he will be near enough to attend the next Reunion, even if it is impossible to get to this one. — FREDERICK J. SHEPARD, JR., *Secretary*, 125 Walnut Street, Watertown, Mass. DAVID J. MCGRATH, *Assistant Secretary*, McGraw-Hill Publishing Company, Inc., 330 West 42nd St., New York, N. Y.

1914

It is with great regret that the death of Ralph H. Howes, on November ninth, at Oil City, Pennsylvania, is recorded. While Howes took a number of courses with 1914 and was known to quite a group, he retained his class affiliation with 1913.

A. P. Shepard has returned from South America where he has been for quite some time looking after the acquiring of electric light plants for an American company. The upset world-wide conditions have brought about quite a change in public utility programs, and, accordingly, Shep is now casting around for a new connection that will keep him in this country. He is making his home at present in Providence, R. I. Shep also added to the class vital statistics the information of the arrival of a daughter three years ago. He also reported that his 14-year-old daughter has now grown up so that she is larger than her father, which we will say is going some.

C. B. Rogers has taken up a location at Atlanta, Ga., having moved there from Pittsburgh. We have no information as to what Rogers' new business affiliation is. — The Patent Office still keeps Affel's name on its list. The Patent

1914 Continued

Office *Gazette* has just announced that patent No. 1,847,160 has been issued to him, covering a method of frequency control. Fourteeners in the telephone business seem to maintain quite a monopoly on the issue of new patents.— Frank Ahern writes enthusiastically from Washington regarding his new work with the Government on fire prevention. Frank is doing his best to see that Government bureaus are kept free from fire regardless of how much hot water they may find themselves in.

Our distinguished automobile authority, Professor Dean Fales, has been nominated for the chairmanship of the Boston section of the Society of Automotive Engineers. We understand that nomination is the equivalent of election. Even if this were not true, we feel certain that Dean's story-telling ability would insure him of a successful conclusion of any campaign for the office. Besides, who better than Dean Fales with his swanky English Bentley car could carry off the dignity of this office? — HAROLD B. RICHMOND, *Secretary*, 30 Swan Road, Winchester, Mass. GEORGE K. PERLEY, *Assistant Secretary*, 21 Vista Way, Port Washington, Long Island, N. Y.

1915

Wilbur Swain, VI, the funny man at the Marblehead Reunion, writes from 133 Evergreen Place, East Orange, N. J., the following: "So just stick my ticket in the enclosed stamped envelope (thanks for it) and then the come-on 'how's for a letter and so on.' Well, a line won't hurt me. I am 72 inches long, slightly stooped (aged) and my hair is good, but I have four gray hairs on one side and three on the other; other than that, I have been very good and am now slightly dry, because you bring back pleasant memories. Time out for Amos and Andy.

"I have not seen a Tech man for a lot of time, say way back to the All Technology Dinner in New York at the Hotel New Yorker. At that time, my wife and I got all dressed up and went to the dinner. One Mr. and Mrs. Fifteener present, one Durkee I believe it was, and I did not remember him. Say, what about having a '15 dinner? I must go see Tobey about it. You know there is something wrong with me because I just recalled that I do see Tech men because I always lunch at least once a week at the Technology Club. We have a very nice select two dozen there every week except Saturday."

Norman Doane, V, contributes this from his new address 1316 Greenwood Cliff, Charlotte, N. C.: "It seems a long time since I saw you in Albany, although it isn't a very long time by the calendar. We drove down from Albany and had an interesting but uneventful trip. We stopped over in New York three days and made shorter stops at Washington; Petersburg, Va.; and Southern Pines, N. C. Our furniture arrived the day before Christmas and we moved in officially on Christmas. Some Christmas! Plenty of southern fire crackers, thermometer at 70°, and a setting or rather upsetting that looked like spring housecleaning.

"I have been busy getting acquainted with the territory and calling on the textile plants which represent the bulk of our business in this section. My territory includes North and South Carolina, most of Georgia, a little bit of Alabama and Virginia for good measure. I hope Henry Ford will soon reduce the price of airplanes. I may need one in my business.

"We certainly enjoyed your little visit in Albany and hope your business will necessitate a southern trip one of these days. For your sake, I hope it will be in the winter time and not in the summer. You certainly would enjoy the so-called winter we are having down here now. It is more like April or May. In case I don't see you sooner, I hope to see you at our Twentieth Reunion! The next time I am in New York, I shall give your office a ring and hope by a long chance you will be there instead of in Boston. Mrs. Doane joins me in sending best regards."

Under the black headlines "Fidelity Machine Head Sees Opportunities in Depression" in a Philadelphia paper follows a good picture of H. W. Anderson, II, and a column article by Andy on something to do with the well-known and lingering depression.

Here's an interesting bit about Stan Baxter, III, from the other side of the equator. Stanley M. Baxter '15 writes that he is still with the Braden Copper Company at Rancagua, Chile. The only other Technology man there at the present time is Frank Curtis '12. Prior to 1925, Baxter operated as an independent engineer, but closed his office in that year, and since that time he has been working at tin mining, milling and some smelting in Bolivia. The last three years he was in that country were spent on railroad construction and location with the Antofagasta-Bolivia Railways from Potosi to Sucre, and also with Kennedy & Carey, a New York firm, on the location and construction from Cochabamba to Santa Cruz de la Sierra. When the Siles government fell, all construction work was stopped. He then went to Peru, where he found conditions worse than in Bolivia. The railroad project in Brazil fell down when the administration of Washington Luis fell. There was practically nothing doing in the nitrate fields of Chile so he returned to Braden about a year ago, where he has been working on special engineering problems. Recently he took over the tailings retreatment plant, and in April he took over the job of the tailings disposal engineer in addition to his special work. He states that he is still single.

Carl Dunn, VI, comes to life with this concise résumé of his life since Institute days. I hope some of the Chicago classmates look him up. I haven't heard from you, Carl, since high school days in Boston, so write me again soon. "Not having had the opportunity to be at a reunion in Boston since '15, some of the Class may be interested to learn where I have been. 1915–1918, Winchester Arms, New Haven, Conn.; 1918–1921, Ansonia Manufacturing Company, Ansonia, Conn.; 1921–1922, Wentworth Institute, Boston, Mass.; 1922–1931, Charles E. Bedaux Company, 435 N. Michigan Avenue, Chicago, Ill. Would like to hear from any of the Class located in this vicinity."

Many of us have wandered far from fields of engineering, but Herb (Speed) Swift, II, shows us a way to forget the wheels by extending his gentleman's farming into rural politics. Pause and read what he writes from Elkins, N. H. "I have two parcels of land in view up here for which I must keep my gun loaded with plenty of cash. That kind of gunpowder seems to be rather scarce these days in every quarter, high or low. As for myself, my 200 lbs. are a great hindrance to me in trying to elude the local politicians. Some want me to be tax collector, others are absolutely sure that my M. I. T. teaching superbly fits me for the job of School Board. The latest attack is that of selectman. My wind is getting short, but I must hold out until Town Meeting day, which is March 8. After that they will let me alone. Keep my name on your local list as all I need is an excuse like a class dinner to bring me down to Boston." Maybe Herb is something in that town by now.

Don't miss the next issue. The last one, and it's going to be a great 1915 column. — AZEL W. MACK, *Secretary*, 379 Marlboro Street, Boston, Mass.

1916

I am pleased to note that several of the Class are getting into the habit of dropping me a line now and then unsolicited. Isidor Richmond advises: "I am writing to tell you of the partnership into which I have entered with Mr. Reginald A. Morgan. The offices in which I have been carrying on my practice during the past seven years at 248 Boylston Street will continue to be used by the new firm of Richmond and Morgan.

"Mr. Morgan's ideas about keeping the practice of architecture on a high professional plane are in line with my own. He has had a long previous experience, and his talents and personal inclinations are more along the business and construction side of the profession. Since my own talent seems to lie more strongly in the planning, designing, and artistic side and keeping abreast with modern tendencies in architecture, we are better equipped to serve our clients.

"Mr. Morgan is personally a man of excellent character and a very fine type of gentleman, and I feel sure that my friends and clients will take the same pleasure in knowing him and in doing business with him that I personally enjoy in my contact with him."

A. D. Pettee writes asking for Course VI news. Can't some of you fellows in that course drop me a line so that I can answer his request? He writes: "Some of us fellows who dropped into M. I. T. in the middle of things did not have the opportunity of the first two years to meet and know many of our classmates, so it is seldom that I know the occasional contributor. Can't you send along a few Course VI items? It may be of interest to

1916 Continued

a few of the gang that at present writing I am District Engineer, Central District, of the General Cable Corporation, with headquarters at Chicago."

Ed Weissbach as usual gives me a very newsy letter. "Your suggestion, 'take up golf and forget your worries,' strikes me in the right spot. Now Henry, what is the first cost of golf, and what is the upkeep, insurance, taxes, and overhead?

"I haven't seen any '16 men since I last wrote. Once in a while I see Obie Pyle who seems to be doing pretty well with the Brown Instrument Company in Philadelphia. He told me he got caught in a bank that failed, but we did too, so that is no news. Spencer Hopkins wrote me the other day. He lives at 25841 Pembroke Road, Royal Oak, Mich. Hopkins is with the General Motors Corporation and seems to like the work. He went through the experience of looking for a job three years ago, and finally started in at the bottom with the Hertz-Drive-Yourself Company, and then when they were taken over by the GMC he went along. I had written to Spencer to find out how he managed his campaign.

"I am devoting all my energy these days to finding a job. We, or rather you, did not buy enough soup last year and as a result the Campbell Soup Company and I are not together. They had a reorganization of the department I was in, and being the youngest member of it, I naturally had to be dropped. I did not realize how rotten business is until I started looking for a new connection. Seriously, Henry, if you hear of anything let me know, will you? I have the usual inquiries out — Eddie Miller, Col. Locke, ASME, and agencies — even wrote to Hovey Freeman. With all my friends advised that I want a job and not a position, I may get something. I certainly wouldn't if I didn't tell them. Nat Warshaw was all keyed up last June to get me to go with L. S. as a salesman. When Nat finally got the news, he advised me to spend my time looking for a job instead of the elusive orders. So there it goes."

I am sorry to note the death of David L. Jacobson as of March 6. He was with the Koopers Company in Pittsburgh, Pa. — HENRY B. SHEPARD, *Secretary*, 269 Highland Street, West Newton, Mass. CHARLES W. LOOMIS, *Assistant Secretary*, 7338 Woodward Avenue, Detroit, Mich.

1917

A young Wall Street broker, according to the Boston *Transcript*, has achieved fame in the ranks of the opposition to Prohibition; not only is he Master of the Crusaders in New York, but he has actually appeared in a motion picture with one Gene Tunney, a 'former prize fighter." It develops that this man Tunney is a friend of the aforesaid young Wall Street broker who has joined him in the battle against the 18th Amendment. We have not been able to ascertain the name of the picture but assume it may be "Tunney and Curtin Fight for a Drink."

We gather that Arizona's lone Congressman is Lewis William Douglas, who took a postgraduate course at the Institute and has the honor being considered a member of the Class of 1917. Mr. Douglas achieved some prominence recently as the author of a resolution for a special committee to study the twin problems of governmental reorganization and economy. He is considered one of the more influential of the younger members on the Democractic side of the House.

Malcolm Cameron Brock, better known as Mike, and for some years with the O'Brian, Potter Company of Buffalo, is now spending his evenings singing over the radio with the famous Romancers Quartet. Mike likes the work, has succeeded with it and is getting fat on the job. — RAYMOND S. STEVENS, *Secretary*, 30 Charles River Road, Cambridge, Mass.

1918

At the second of the Sunday afternoon musicals so happily presented in Walker Memorial, we saw Edgar Hopkins and family. His picture in our senior portfolio is absolutely up to date; moustache, bone glasses, and the hint of some day combing his hair with a towel. Somehow one was reminded of Henley's line, "The menace of the years finds, and shall find me, unafraid."

Diversity between our academic training and our niche in the work-a-day world is strikingly illustrated by address changes from Rev. Claudius Pritchard of Atlanta and Dr. Stanton Burgess of Boston.

We knew of course that it would happen some day, but had hardly anticipated it so soon. Uncle Albert R. Mumford wrote his nephew (one of the bright boys taking our course) all the embarrassing truth concerning undergraduate days, including something that never happened. Indeed, he accused us of sticking a thumb tack into Professor Currier's wooden leg. How romantic! Mumford lives in Bogota, N. J., has three daughters, a Studebaker, and possibly is the original of these stimulating gleanings from one of nephew's recent offerings:

"All of us have ideals and mine is to be as like a certain man as I can possibly be.

"He is a quiet man, typifying the phrase, 'Still Waters Run Deep.' One could not pick him out of a small crowd and say here is an outstanding engineer. No, he does not look the part he plays and one would probably find him in the background. He never speaks of the things he has done or is doing, unless asked. Even then he shifts credit to the men under him. He is liked by all the men in his company, and most of them would do anything he asked. He enjoys sports and was actively engaged in them while at the Institute. He is well known for his impartial dealings. He fired me once to teach me a lesson which I will never forget, then hired me four years later. He works for the sheer love of engineering, not for money. Yet he earns an enviable salary. There are two or more companies that would hire him instantly if he cared to change his position. He is truly a big, big man although he would try to make everybody believe he doesn't amount to very much. He embodies the essence of modesty in every act.

"Perhaps you may ask about his bad qualities. The only thing I can say is, I am still in search of them." Take your curtain call, Uncle Albert.

Frank O'Connor silently folded his tents and departed for Brooklyn, N. Y., last month where he is to have charge of the aeronautical education of the young idea in the Brooklyn Technical High School. After a few exposures he'll be saying "boird man" if you can pronounce it that way.

Last week Franklin Wells from South Bend, Ind., left regrets nailed to our office door. Sorry to have been lecturing in Boston instead of receiving the old timers.

And from far away comes the news that at its meeting of March 9, Rolfe A. Folsom was elected Secretary of the M. I. T. Club of Northern California. — On February 29, after the minutes of the last meeting were accepted as read, the Alumni Council appointed C. B. Rogers Secretary-at-large. It is our earnest hope that these gentlemen will enliven their records with a few literary touches learned at, or as near as possible to, Tubby Rogers' knees.

George Hutchins, may his tribe increase, sends a friendly letter to say that the Ace Sign Company of St. Petersburg, Fla., is still making the night glow with Neon tubes. With business growing every month, he should have a sheaf of job applications on his desk shortly. "If you learn of any Eighteeners Florida bound," sez he, "please give them my address as we always have plenty of room, with free oranges and grapefruit from my grove."

A Western Union messenger has just clattered in with the news that Mr. and Mrs. Edwin R. Harrall are honeymooning in the south. — F. ALEXANDER MAGOUN, *Secretary*, Room 1-305, M. I. T., Cambridge, Mass. GRETCHEN A. PALMER, *Assistant Secretary*, The Thomas School, Wilson Road, Rowayton, Conn.

1920

Perk Bugbee's daughter arrived just in time to get into these notes, born March 25. This makes two boys and one girl, which Perk thinks is an ideal family.

I had a pleasant visit with Ken Akers and his charming bride recently. Your Secretary's wife made the comment that Ken was handsomer than ever so I am passing this along to you for what it may be worth.

Benjamin Morse of Course VI has been located in Reynoldsburg, Ohio, address, Walnut Hill Farms. — John McLeod, Jr., is in Los Angeles at 615 North Kilkea Drive. — Carl Leander is now living in Park Ridge, Ill. — HAROLD BUGBEE, *Secretary*, 7 Dartmouth Street, Winchester, Mass.

1921

It is with deep regret that we record the death of Carol Leon Stone as a result of an automobile accident December 27,

1921 Continued

1931. We have received from Professor Locke the following quotation from the Douglas, Arizona, *Daily Dispatch* of January 6, 1932: "Carol Leon Stone, who had lain at the point of death in a Bisbee hospital since December 27, died at 8 A. M. yesterday of injuries received when the automobile in which he and three companions were returning from Warren early Sunday morning, December 27, crashed against a bridge parapet, flinging the occupants on the roadway. Mr. Stone sustained a fracture of the skull and other injuries.

"Stone, who was 32 years old, was the only son of Mr. and Mrs. William L. Stone of Boston. Following his graduation from M. I. T. he pursued the study of chemistry at the University of Arizona where he also received a degree. On May 24, 1924, he was married in Tucson to Miss Margaret Reed of Portland, Maine, daughter of Mr. and Mrs. George P. Reed of that city, the newly-wed couple leaving for Gold Road where Mr. Stone followed the profession of metallurgical chemist for about a year.

"Mr. and Mrs. Stone moved to Douglas in January, 1925, he having obtained a position in the chemical department of the Copper Queen smelter of the Phelps-Dodge Corporation, and their only child, a son, Ross Reed Stone, was born here on July 25, 1925. Mrs. Stone became ill and died September 26, 1930, in a Tucson sanitarium. Mr. Stone remained in this city and was still in the service of the Copper Queen chemical department at the time of the tragic accident.

"Stone had an unusual record for amateur athletics, possessing several medals and trophies won in college teams in the East, and was a member of the University of Arizona track team while a student at that college.

"Mr. Stone's parents will arrive Friday and arrangements have been made to hold the funeral that afternoon. Members of the local post of the American Legion, of which Mr. Stone was a prominent and active member, will be in charge of the obsequies and the pall bearers will be recruited from their ranks." Professor Locke adds that he has received a letter from a former student, who is now in Arizona, to the effect that Stone's work as a staff chemist for the Phelps-Dodge Corporation for the past seven years involved both control and research. He was highly esteemed by his associates for his work in these fields. Burial was in Douglas.

To this we might add that Stone was born in Allston, Mass., on December 2, 1899, and entered Technology in the freshman year, having prepared at Brighton High School and the Chauncy Hall School. He received his degree in Course III. At the Institute he was a member of the Mining Engineering Society, Chauncy Hall Club, Varsity Club, Freshman and Varsity Cross Country Teams, Track Team for four years, and was a wearer of the "T" and also of the "ATA" and "CTC."

The November, 1931, issue of the *Proceedings* of the Institute of Radio Engineers contains a paper presented at a convention of that organization by C. Baldwin Sawyer on the subject of "The Use of Rochelle Salt Crystals for Electrical Reproducers and Microphones." Sawyer, who received his Ph.D. with 1921, is President of the Brush Laboratories, 3715 Euclid Avenue, Cleveland, Ohio.

Maxwell K. Burckett has just phoned that he is moving from Montclair to 78 Willow Street, Glen Ridge, N. J. Max is with Erwin Wasey & Company, an advertising agency, located in the Graybar Building, New York, N. Y.

The *Bell Laboratories Record* for March, 1932, has an article by Norman Insley entitled "Measuring the Illumination from Switchboard Lamps." Norm came to the Bell Telephone Laboratories in the year following graduation and was engaged for a number of years in the preparation of specifications and instruction bulletins. Since 1926 he has been associated with the development of telephone switchboard lamps, lamp caps, and resistance lamps. In connection with this work he has been concerned with the development of improved photometrical methods for measuring the signaling ability of switchboard lamps. He is married and makes his home at Nanuet, N. Y.

Harold F. Stose has been largely responsible for the development of the new phonograph record material known as "Vitrolac." Stiessen is still with the Engineering Department of the RCA Victor Company, Camden, N. J., and he and the Mrs. are making their home at 232 Hopkins Avenue, Haddonfield, N. J.

The absence of letters from members of the Class for such a long period makes us wonder if any of you are really reading these notes and our regular pleas for news. Why not put those good intentions to work and write that letter now! — RAYMOND A. ST. LAURENT, *Secretary*, Rogers Paper Manufacturing Company, South Manchester, Conn. CAROLE A. CLARKE, *Assistant Secretary*, Bell Telephone Laboratories, Inc., 463 West Street, New York, N. Y.

1922

Heinie has told you of the program for the Repressive Reunion. By the time this issue of The Review is in your hands you will know the details of our plans. Come one, come all; you'll have a good holiday.

Fred Justice writes from his home at 4143 43d Street, Long Island City, the following: "I am still with Post and McCord. Am looking forward to being at the next Reunion and seeing again the bunch. If our next Reunion equals our last, it will have to be a great one. (Come, Fred, you can't lose.) On October 10, I was married to Eleanor Gertrude Haddock."

Hersilia Warren of Winchester was married to Bill Elmer in New York City on December 27. They will live at 353 Harvard Street, Cambridge. Bill is with the Edison Electric Illuminating Company in charge of the technical department. — John Sallaway was married on January 6 to Margaret Candee Howland of Titusville. They will live at 3620 148th Street, Flushing, N. Y.

Gus Oddleifson, with Rothschild in Rochester, was married on January 6 to Miss Marjorie Harris. — The engagement was announced recently of John B. Wright to Miss Catherine Mathison of Clinton. — The engagement was announced recently of Miss Myra B. Goodman to Isaac Mark, Jr. — Clayte Grover writes to tell of the birth on January 6 of Patricia Athalinda Grover in Buffalo.

Mal McGhie talked to the Milwaukee Chapter of the Society of Industrial Engineers at the Athletic Club there. He told them how to defeat the depression with new ideas in production and salesmanship. (Save some for me, Mal, at Reunion.) — Bertram Weber, of White and Weber, architects in Chicago, has been commissioned to design the new post office in Oak Park, Ill. The government has appropriated $600,000 for the building.

Herb Allen writes that his address now is 34 Rossini Boulevard, East Windsor, Ontario, Canada, and Tommy Thomson writes that Charlie McGrady is with the Barber Asphalt Company in Maurer, N. J., and is living in the Oranges. Tommy thinks that speeches at Alumni dinners should not last more than five minutes. At Reunion, Tommy, there will be none officially — please note, Eric.

Al Browning lunched with your Secretary a few days ago. He and Chuck are telling Detroit to come East in June. Tommy Craig is coming from Elmira. The Rochester boys are laying plans. In fact, in the several cities visited recently, I cannot remember a man who is not coming. Boost hard for the Repression Reunion. Let's put it over in a big way. See you there. — RAYMOND C. RUNDLETT, *Secretary*, The Curtis Publishing Company, Lincoln Building, 42d Street, New York, N. Y.

1923

Just about the time I decide that our Course Secretaries have folded up and quit, there comes a peep from some one of them. B. E. Proctor turned in some Course VII notes last month and this month Al Pyle contributes a newsy addendum to this department. For which, many thanks. Won't some of the other long silent Course scribes favor us with some offerings?

A clipping from the Woonsocket (R. I.) *Call* announces the engagement of Clayton F. Harvey, I, to Miss Phyllis Louise Enegren of Taunton. Harvey is with the Massachusetts Department of Public Works.

The announcement in a recent issue that Red Adams XV is back from Paris brought further particulars from him. He writes: "A brief review of my doings to date are as follows: From August, 1923, until March, 1926, I was with the Vaughan Knitting Company at Pottstown, Pa. In March, 1926, I started with the Massey-Harris Co., Ltd. of Toronto, Canada, and for three years spent my time in the wheat harvests of the States,

1923 Continued

Canada, Argentina, and North Africa. In April, 1929, I was transferred to the European organization, and had headquarters in Paris for two and one-half years. During that time I was in all the important European countries except Russia. On December 20, 1930, Miss Mildred McGall of Tucson, Ariz., and I were married at 'St. Martins in the Fields,' London.

"Now I am back again at the head office in Toronto. The well-known, 'littlest boom in years' is right with us, but needless to say, I am glad to be back on this side of the Atlantic."

I also have some further particulars from E. E. Fairbanks who catalogues his activities as follows: "Will account for myself after leaving Tech. Became mineralogist of the Rare and Precious Metals Equipment Station of the U. S. Bureau of Mines. Resigned after three years for better position with E. Leitz, Inc., N. Y., as Technical Adviser and Sales Representative. Accepted position as member technical staff of the new New York Museum of Science and Industry. Was their publicity manager for three years. Am at present a science editor in above service. We are starting on a small scale, but hope to gradually build up a real sizable organization. It may be of interest that I have published one book and hope to have another out later (as soon as conditions are such that books may sell a little better than at present). Also have about eight inventions to my credit (but no patents under my own name). Am married and have one youngster — a boy. Did see a gold prospect in Nevada that looked good to me. It is still there and I may yet look into it more closely."

Among recent address changes which appear to have some significance are the following: William B. Gurney, II, from Allentown, Pa., to Baton Rouge, La.; Frank J. Salus, VI, from Cleveland Heights, Ohio, back to Cambridge, Mass.; Gerald L. White, XV, from Bogota, Colombia, to London, Ontario; Bernard L. Chapin, XV, from Belmont, Mass., to Waukesha, Wis.; Harry P. Kelley, II, from New York City to Meadville, Pa.; Alfred Perlman, XV, from Sandpoint, Idaho, to Staples, Minn.; Howard Shipley, IX-B, from Jamaica Plain, Mass., to Brooklyn, N. Y.; Lloyd G. Taylor, XV, from St. Louis to Ellicott City, Md. — HORATIO L. BOND, *Secretary*, 31 Concord Ave., Cambridge, Mass. — JAMES A. PENNYPACKER, *Assistant Secretary*, Room 661, 11 Broadway, New York, N. Y.

COURSE VI

It's about time the rest of you fellows were hearing from the electricals of '23; we're really very much alive, but have been too busy trying to roll away the depression to do much contacting. But here goes: Billy Hahn, who used to make so much noise with Jack Keenan back in the classes, left his desk in Chicago (G. E. Co.) to address the A. I. E. E. convention here in New York recently on "Standard Decrement Curves" which as you all know pertains to the decay of voltage surges on power lines. They pinned a microphone on Bill's lapel but he didn't need it; he always was blest with a wonderful voice. But listen: Bill and his lady, Rose, came here also to have a swim in the fine St. George Hotel swimming pool; got registered at the hotel all right and then never went in the water. Bill and Rose and I went a-top the Chrysler Building and saw all the sidewalks of New York.

And say: Rod Goetchius is the proud father of a second son, Arnold Whitney, born January 31 last. Norman Eldridge, the other son, is several years old by this time. Get the cigars at 195 Broadway. All this helps because we notice many of the boys are fathers to little daughters, and Rod is simply trying to keep the sex distribution even. Not all yet: Charlie Snow, on March 6 last, became the father of a second son. Charlie is doing his bit to provide future engineer material. — A. J. PYLE, *Secretary*, 333 East 43rd St., New York, N. Y.

1924

Again I am indebted to Professor Charles E. Locke '96 for transmitting to me through The Review two very complete résumés of the activities of members of Course III. I shall impart them complete.

"Robert R. Le Clercq returned from Africa last June and instead of continuing as a wild geological engineer in remote parts of the earth, he has become just the antithesis. It seems that on his return trip from Africa he met a young lady, with the result that in ten weeks, namely August, he was married in Chicago to the former Mrs. G. M. Stevens, Jr., the daughter of Mr. Alex E. Carqueville and Mrs. E. Jeffery Carqueville. The bridal couple has been living on an old farm in Cheshire, Conn., and enjoying the peaceful, quiet country life. Mr. Le Clercq states that it is some change from the mental worry of his African work where at one time he was running two mines producing around 300 tons of tin ore, had four Bantas and Keystone drills in operation, and two prospecting parties in the field. While this African experience was a wonderful one, he hopes in the future to be able to confine his geological work to this continent. He reports that he ran across P. C. Putnam and Charlie Frank in New York in December. The former is reported to have given up mining and geology to devote his time to the family publishing house and the latter is still presumably in Wall Street."

"Ray Meade who is with the Mississippi Gas Company, Birmingham, Ala., reports that so far he has been fortunate enough to hold his job. He was engaged on the extension of natural gas lines through Mississippi and Alabama, which progressed very rapidly up to about a year ago, but since then construction has ceased, and he has had nothing but operating problems, and it does not look now as if he could expect further activity in the way of construction of new extensions this year. He is making his home in Laurel, Miss., for a while which, he states, is a beautiful little town of about 18,000, centrally located. It is about 100 miles from the Gulf of Mexico and 160 miles from New Orleans, with fairly good roads, so that when the quiet of a little town becomes irksome he can run into a big city."

In a recent issue I reported on the activities of Denton Massey. In *Time* for December 28 there appeared under the caption "Masses to Massey" a very complete picture of him presented in the terse and sometimes pert way characteristic of that magazine. Herewith is their description of Denton and his religious work: "Founder of the York Bible Class in 1925 was a rich, handsome (6 ft. 3½ in., 215 lb.) young man, Denton Massey, 31, grandson of the founder of Massey-Harris Co., Ltd., largest maker of farm implements in the British Empire. Graduate of Massachusetts Institute of Technology, Founder Massey is a kinetic, athletic Toronto socialite who worked in the shops and harvest fields of the family company before becoming an official in the Toronto factory. He is reputedly worth $1,000,000. A practical Christian, he is now a mild Socialist. Like Erdman ('Erd') Harris (also Toronto-born), Denton Massey appeals to youth, in a direct, personal manner. The enrolled class now numbers some 2,400, has outgrown four meeting places. Broadcast every Sunday, it is undenominational, open to all men. Radio mail streams in, addressed to 'The Reverend — The Doctor — Very Reverend — Leader — The Honorable — Teacher — Lecturer.' Though some people find Leader Massey's faith — real and sincere as it is — occasionally of the luncheon club order, none questions his influence toward a wholesomely liberal religious movement."

An item appearing in the Tampa (Fla.) *Times* last January serves to locate Dave Grant, but doesn't furnish much specific information about him, his address, or his work. From the clipping I should judge that Dave was a member of a group appearing regularly on the radio in support of some food, medicine, or tooth paste absolutely essential to life and happiness. But what is your guess? "Funnyboner Dave Grant worked his way through M. I. T. directing a small dance orchestra. He found time between waving the baton and pursuing his engineering studies to row on the crew. After leaving college, he made his living as a pianist. He never realized his possibilities as a vocalist until he met Bunny Coughlin, who persuaded him to form a harmony team. They secured the services of Gordon Graham, who had just left Dartmouth, and the trio has worked together ever since."

To wind up this month I have two letters — one from Paul Cardinal, signing himself as the "ex-lounger," now with Hoffman-La Roche, Inc., of Nutley, N. J., and the other from Dick Shea, President of his own company, United Radio Laboratories at 27 Harvard Street, Arlington, Mass.

From the first: "My own nose for news lets me know I should have written you promptly at 9:31 (or thereabouts) A.M.

1924 Continued

on Sunday November 29th last, to advise that ten seconds before there had been ushered into the world still another being who would, for a time at least, have to carry the name of Cardinal. As a matter of fact, I was in church at the time and so did not have my Remington Portable with me — in fact, if I had, I doubt if I could have used it except perhaps while the collection was being taken up and the clinking of change was affording a chance for masking the tapping of keys — so I missed a scoop for you. At that, however, there are probably no more than three of my classmates who have heard of the existence of Joan Ruth Cardinal, so mention of her in the Class news would hardly be old stuff. That makes two Cardinal sisters, Lorene Mary having preceded Joan by 17 months. . . ."

From the second: "Notice my name among those whose latest address is unknown, hence the letter. Am rather surprised that any mail sent to the address given should have been returned, as it is all forwarded to this address. Now that I've gotten around to writing, I suppose a little news will be in order. Am still adhering to the old radio industry, if it can be called such, at present trying to persuade this company of mine to get up on its feet and go places. Haven't hit the proper brand of hoss liniment, or whatever is needed, as yet, but am still trying. The family has grown, as there is an heiress to the future Shea millions, name of Doris Edna, at present aged three months and a half. Quite a girl." — HAROLD G. DONOVAN, *General Secretary*, 372 West Preston Street, Hartford, Conn.

COURSE V

I have written to more than half of the Course V men and so far I have received two replies. The first letter received came from Francis W. Brown (Brownie). He, as has probably been reported before, is teaching at the Drexel Institute, Philadelphia. He showed very much foresight in marrying a Drexel instructress of the Home Economics Department, Child Care Division (although he does not give her name). He is working for his Ph.D. under Professor Kohler of Harvard on the reaction between desyl chloride and methyl alcoholic KCN.

The second letter is from Charles S. Webber (Sterling) which follows: "To make a short story long, my field of endeavor since parting with our Alma Mater has been entirely in the cellulose ester plastics. The first three years were with Eastman Kodak Company on cellulose acetate and related organic esters. I am now with the Fiberloid Corporation who manufacture cellulose nitrate and acetate plastics, i.e. celluloid. Anything from dental plates to airplane windows are included in our line and we also have a lacquer division. That covers the business end pretty well and as for the personal I can boast of a fine wife and a little girl four years old. Now all that will require more space than The Review should allot any graduate even in times of good business. By the way, Morgan is with the Triplex Safety Glass Company as chief chemist." — JOSÉ W. LOUBRIEL, *Secretary*, 460 Franklin Avenue, Nutley, N. J.

1926

Last month, the Secretary committed an unfortunate and grievous error in announcing the death of Edwin W. Southworth, Jr. The mortification that is felt for having propagated, however innocently, so dreadful an error is matched only by the relief and delight that has come from the discovery that it was an error.

The Secretary was misled by the Alumni Office which in turn had been misled by the announcement of the death of Southworth's father. The Secretary publishes this apology along with his sincere hope that years of great number and plenty will pass before an authentic necrology note for Southworth will be necessary.

Dave Shepard has come to the aid of your Secretary and supplied a few nugae for this section. "Rather frequently," writes Dave, "do I see Earl Eastman, who is a safety engineer in the Safety Inspection Division of The Standard Oil Development Company, General Engineering Department (how's that for a titular orgy!?) and I frequently hear from and about J. Prince Warner who is on the technical staff of the Development and Research Department of the Standard Oil Company of Louisiana, where I was for two and a half years after leaving the institute.

". . . I had the very real pleasure of dining with Dick Pough in Philly last fall, and there I also saw the erstwhile Lounger, Whitney Ashbridge. Ed Gohr I see daily, since he, too, is in our office here. Willard Vaughan is in the D. & R. Department, with Prince Warner in Baton Rouge."

The Secretary is chagrined that the news of Howard Humphrey's engagement which appeared in the Boston newspapers last December was completely overlooked. The young lady is Miss Virginia Kimball of Swampscott; the marriage date is yet unfixed. — John Wills is the father of a daughter.

Word has been received of the marriage of Samuel McMurtie, Jr., to Miss Mary Chute of Boston. — June has been chosen for the marriage of Miss Catherine Neff to William McAlpine Walworth. — On February 13, Mrs. Virginia Howard became the bride of Irving Ludgate Murray. The Secretary extends his congratulations and best wishes. — J. RHYNE KILLIAN, JR., *General Secretary*, Room 11-203, M. I. T., Cambridge, Mass.

1927

Thanks to several of our course secretaries and returns from the reunion questionnaire, business once more is picking up. Lee Miller sent his Course I notes in for the April issue, but they arrived just too late to do any good. We print them now and add a letter picked up on the questionnaire.

As all of you know from your mail, a committee consisting of Dike Arnold, Ray Hibbert, John Drisko, Jim Lyles, and your Secretary have been at work on plans for our Five-Year Reunion. It is still too early at this writing (March 25) to do more than outline our tentative plans, but, since you will be reading this on or about May 1, you can bank on one thing. And that thing is that the time, place, price, and other details will have been arranged before May 1. If the committee hasn't brought the details to your attention, there has been a slip somewhere and you are urged to get in touch with the committee at once through your Secretary.

Phil Rugg has agreed to take charge of transportation, an important and difficult assignment. On his shoulders will fall the job of getting the bunch to the Reunion scene and of working with the fellows in New York to see what can be done about their coming up by boat. Railroad excursion rates into New England prevail during the summer, a fact worth keeping in mind. A summary on transportation will have been sent you or will reach you shortly.

More than 200 replies to the questionnaire have been received so far, and of these there are 38 who say definitely that they are coming and 87 who say maybe. The week-end of June 4 and 5 seems to be a slight favorite over Memorial Day. This is a good time for those who are planning to look over the Institute, as Commencement comes on the following Tuesday.

It is the consensus of opinion that this Reunion be a purely stag affair, with no wives allowed within a five-mile radius of the place. That will, we hope, work no hardship on those who voted in favor of having wives attend. Any who want to make the trip to Boston with their wives and have no plans for them during the 24 to 48 hours of the Reunion are urged to make that fact known to the committee.

The committee has been in touch with a number of hotel and club managements which seem to have something to offer us at a price we can afford to pay. Ideally, the place we pick should be accessible by passable roads; have bathing, golf, tennis, and other athletic facilities; and be far enough removed from noisy neighbors to prevent their interfering with the restful quiet we have been waiting to enjoy for these five years.

So far, the only place meeting these specifications with an assurance of exclusive occupancy is the Mayflower Hotel just south of Plymouth, Mass., at Manomet Point. But there is no use in going into this here, because you will have already been informed about the place.

Reunion questionnaires sent out by first class mail to the last known address of every member of the Class have been returned by the post office for the following men. "Moved, left no address" and "not here" were the comments. Anyone knowing the whereabouts of these men will do us a favor by sending us their addresses: James E. Allison, Fort George; G. Meade, Md.; Charles T. Barker, Arlington, N. J.; John E. Brooks, Roslindale, Mass.; Charles L. Douglass, Boston,

1927 Continued

Mass.; Francis P. Frazier, New York, N. Y.; Walter O. Locke, Cincinnati, Ohio; Edgar N. Rousseau, Bridgeport, Conn.; Albert F. Schaad, Brooklyn, N. Y.; Norman A. Steimer, Beaver Falls, Pa.; Robert B. Watson, Newark, N. J.; Peter J. Wiezevich, Elizabeth, N. J. — JOHN D. CRAWFORD, *General Secretary*, P. O. Box 89, Wayland, Mass., or General Radio Company, 30 State Street, Cambridge, Mass.

COURSES I AND XI

On February 15, Dr. Compton talked before the Technology Club of Syracuse, and it was the pleasure of the Central New York M. I. T. Club to give a dinner in his honor before the talk. The Technology Club is not to be confused with the M. I. T. Club, as it is an engineering club which includes members of the various engineering and business firms of the city. It was quite a pleasure to meet Dr. Compton, and hear his talk, "Science Sees the Invisible." His striking personality and friendliness makes one wish to know him better.

J. G. Nash gives us his first letter since graduation. His address is Austin Bridge Company, Columbus, Texas. "I was glad to hear from Course I in the last Review and to know that you were standing the depression o.k. I will give my location in hopes that others will do so. I am superintendent on a bridge that the Austin Bridge Company is building over the Colorado River at Columbus, Texas. At times my life is almost as hectic as when at M. I. T. We are working day and night to get out of the river before the spring floods. An unruly concrete caisson has been causing me as much grief as the inspectors. For the last four years I have been on form design and concrete construction, spending part of my time in the office, but most of it in the field. At times the difficulties seem more than the monetary compensation, but when the job is completed and it looks good, then I feel repaid.

"That is the way with most of us uncivilized engineers. We have to like the work to make a go of it. I wish I could get an engineer like Carl Redd to work on the same job with me. A year ago I was on a large bridge and had a resident engineer that was old enough and experienced enough to be a real help and the job moved along with everyone happy.

"I seldom see Tech men. They probably would not care to recognize me in my work clothes. My wife does not understand why I do not dress like an engineer should. We have a husky boy who is a constant delight."

Here is a letter from John J. Boyle, appended to his Reunion questionnaire. "I am working in Boston for Coleman Bros., Inc., builders of the underpass near M. I. T. After leaving Kentucky in December, 1927, I went to work for Dwight P. Robinson on the North Station and Boston Garden. Shorty Newell, who was with me on the Ohio River, was also a fellow worker with Dwight P. In the spring of 1929 I went to New York, where I secured a job as chief of party with the Gulf Refining Company on a survey and layout of an oil refinery on Staten Island. However, the lure of Boston was again too great. In June, 1929, I started working for a local building contractor, only to find myself out of a job in June the following year, 1930. I was very fortunate to land a job, almost immediately, with Coleman Bros. as field engineer on underground steam line construction. The Edison Company now have steam lines under a great many of the streets of Boston.

"Here is some news of a few of the Class of '27. Jerre Spurr is now assistant engineer for the Metropolitan Water Supply Commission and is in charge of the soil studies on the new earth dam to be built at Enfield. — L. Rasmussen is working for the State over at Commonwealth Pier on bridge design, while Reg Jacobs is in another department at the same location."

I hope more of you strangers will write before this season is over. — LEE MILLER, *Secretary*, 320 Nichols Avenue, Syracuse, N. Y.

COURSE V

George Standley says: "I am now working for the du Pont Rayon Company, Buffalo, N. Y., as a research chemist after finishing most of my work for the Ph.D. degree at the Institute. Finished at the Institute last summer, and expect to receive my degree in organic chemistry this June. Have been working for du Pont Rayon since September, 1931. Hope to see all the gang at the Reunion." — EDWARD T. DUNN, *Secretary*, 315 East 58th Street, New York, N. Y.

COURSE X

The only information which I have is concerning Pub Whittier. The others have got beyond reach, but I now have a list of addresses and hope to have a more complete report for the July issue. Pub Whittier is now works chemist of the Salem plant of Congoleum-Nairn, Inc., at Salem, N. J. Since his arrival in the town of Salem, he is reported to be having and reports that he is having a better time than since 1927.

I am still in the research department of Congoleum-Nairn, Inc., at Kearny, doing development work.

Here is a letter from H. P. Ferguson, who says: "I'm still with The Dorr Company and now am located in their laboratories in Westport, Conn. (Something fishy about this. A reunion questionnaire from Ferg gives his address as 715 East 25th Street, Paterson, N. J. The latter is more recent by a few days, so I suggest sending mail in duplicate to both addresses! J. D. C.) Some day I'm going to try to discover why everyone puts labs in such forsaken places! I'm supposed to be a petroleum expert, but there is so damn little petroleum needing experting that I'm liable to be doing anything to help get the data to sell a few jobs. I spent practically all of 1930 and part of '31 in Canada, smoothing out the kinks in a cantankerous plant, and with the weather in its present form, I'd just as soon be back there. The only one of the '27 men I've seen lately is Art Connell who still wanders into Boston occasionally when I'm visiting there." — DONALD H. SPITZLI, *Secretary*, 170 S. Clinton Street, East Orange, N. J.

COURSE XV

Returns from Harry Franks and Bennie Levinson were the first to come in on the reunion questionnaire. Harry says: "Still single — working like hell — not making much money — in business for myself — see some of the boys once in a while. (Short and sweet, but covers a lot of ground.)" Harry's address is still 431 Lowell Street, Lawrence, Mass.

Bennie's business affairs seem to be booming, but he has had as rocky a bit of personal bad luck as I can imagine. Bennie was married in December, 1930, to Miriam Madelbaum (Radcliffe '30) at her home in Des Moines, Iowa. She became ill next spring and although Bennie took her back to Des Moines for a change of air, she died on July 6 of rheumatic fever. Since last October, Bennie has been living in an apartment at 27 West 72nd Street, New York.

After leaving school, Bennie went with Gilchrist's in Boston, later with Halle Bros. in Cleveland, and with Hahn Department Stores in New York and Tampa, Fla. Since July 1, 1930, he has been with Independent Merchandising Bureau, Inc., 1441 Broadway, New York. Read about it for yourself: "Group of 140 independent stores — volume from $150,000 to $25,000,000 a year. Total about $185,000,000. Director of Merchandise Planning (in charge of divisions of merchandising, control, and general management). Have visited our stores in every corner of U. S. and Canada. Spend two-thirds of my time in home office. Would welcome any of the fellows who happen to be in my neighborhood.

"Have spent much time since my return from Des Moines and after October 1st in traveling. Have traveled about 17,500 miles in United States, a bit of Mexico, and Canada, by rail, air, and auto. I like the airplanes very much — fast, clean, comfortable, and interesting, especially at night. Am in Cleveland today — March 20 — for a two-day visit. Am just returning to New York after a four-week vacation and business trip combined — as far as Des Moines where I spent nine days with my wife's family, and Cincinnati after a few days with my family. Will be in New York for at least a few months — until midsummer.

"Have seen very little of other '27 men. Any recent word from Wally Kevank? Understand from Richheimer '28 Wally is in Shanghai. Mrs. Richheimer (mother) visited in Wally's home in Shanghai about a year and a half ago. Ran into Sid Gerber in Seattle. He had an apartment right next to the one I took for a few days in a residential hotel — a rare coincidence. He is doing nicely in real estate — chain store leases — saw him again last November. He had been to Mexico on a pleasure trip in the interim. May be in Europe now. He wanted to go.

1927 Continued

Saw Jules Friedman, too, in Seattle. Married, has one child I believe. Moved back to Boston last fall."

Joe Harris reports that he is Assistant to the Sales Promotion Manager of Shell Petroleum Corporation at St. Louis. Still single. — GEORGE C. HOUSTON, *Secretary*, 27 Burnett Terrace, Maplewood, N. J.

1928

Hello, Gil Ackerman, way out in Oakland, Calif. It's evident that you are not a native Californian, old man, because your recent letter mentioned enjoying the sunshine which you get "in between the rain storms." You had better be careful, Gil, because we understand it's almost treason for the natives to even mention rain. We were glad to hear that your work is still going well with the Luckenbach Steamship Company, and to all Twenty-eighters we extend your request for a visit at that company if they get West.

Thanks also, Gil, for the news from Bill Grunwell. Bill is now working as marine draftsman for the United Fruit Company at New Orleans and Mobile. He is also looking after repairs on the ships outside the office, and says this part of the work is more interesting. Bill had a bad mastoid and brain abscess last summer which was very serious. We were very happy to know that he is enjoying good health again.

This month, we are happy to announce the marriage of John Fahey to Miss Hazel E. James. The wedding occurred at Norfolk, Va., on February 4. The Class extends its congratulations. — Jimmy Cullen is also a married man. The ceremony occurred last September, but it was not announced in the press until last month. Jim's bride was Miss Helen May Fitzgerald of Woburn, and his best man was Walter Fitzgerald. — The engagement of Richard Sawyer of New Bedford to Miss Dorothy Hazel Rugg of West Medford has just been announced. Congratulations, old man!

We just learned that Henry Buntschuh became the papa of Charles Dodson Buntschuh last year. Now the news is late because it came by the grapevine route, but if you fellows won't write about these new events, you'll have to excuse late news.

Joe Parks left the E. L. Patch Company about two months ago and went with the Anderson Manufacturing Company, makers of automobile spring covers. He has recently been made plant superintendent and the story of his rise from millwright to superintendent in two months would read like a Horatio Alger tale, but we're afraid Joe wouldn't like the story published. Anyway, we know you'll add your congratulations to ours in wishing Joe continued progress.

Today I received a solicitation from the Toy Town Tavern of Winchendon, Mass., for our Five-Year Class Reunion next summer, which reminded me that we're getting up among the ancients. It's a little too early yet to ballyhoo that reunion, but we warn you now, you must be there! Suggestions for locations, program, times, and so on, are welcomed. It's going to be interesting to see the old gang again and see what has happened in five years! How about some suggestions? — GEORGE I. CHATFIELD, *General Secretary*, 420 Memorial Drive, Cambridge, Mass.

1929

It may or may not be news to many of you, but in spite of the depression frequent announcements of one sort or another would indicate that many of our classmates feel that two and even three can live as cheaply as one. Let us join in offering our very best wishes and congratulations to the long list that I am about to line up for you.

Ralph Jope writes that he met our Dick Boyer, VIII, the other night and gathered the information that on November 10 Dick was married to Miss Elizabeth Davison of Rutland, Vt. Dick also gave out the announcement that Pat Pattison, XVI, is now the father of an offspring, but he did not know whether it was a son or daughter.

Harry Cabot Weare, I, and Mrs. Weare announced the birth of Harry Cabot Weare, Jr., on March 10. The announcement came from Troy, N. Y. Hope the construction business is better there than it is here, Harry, you big family man. — Hereford T. Blake, XV-2, was married November 7 to Miss Alice Louise Coe of Chicago, Ill. Blake is now with Western Electric in Chicago.

Now that I've told all that I know of one of my fraternity brothers, the above Snicker Weare, I'll give the low-down on another, Harold Charles Pease, also of Course I. Charlie Pease was married February 13 to Miss Marjorie Foster Weare of Boston (Harry Cabot Weare's sister). Charlie is working in Boston and they will live in Cambridge.

Laurence R. Moses, VI-A, according to the Buffalo *Courier-Express* of March 5, is engaged to Miss Katherine Mason Van Loan of Buffalo. The marriage is planned for September. — Hereford B. Southwood, I, was married January 16 in New York to Miss Catherine Duncan of Paris, Ky. Southwood is now a civil engineer for the Government and is stationed in New York. — John J. Fahey, VI, was married February 7 to Miss Hazel E. James of Virginia Beach, Va. Fahey is now working in Norfolk for the Virginia Electric and Power Company. — Harold T. Gerry, V, is to marry Miss Ruth E. Whitley of Keene, N. H. The engagement was recently announced. Gerry is now studying for his doctor's degree.

Henry Giles, XI, writes as follows: "I received a letter from Put Cilley, VI, the other day who sent me the enclosed clipping. Put has been out of work for some time, so he has gone into the consulting field with himself. His home is in Salem, but at the time he wrote to me, he was in Buffalo, N. Y. Art Bearse, VI, is out of work, but is going to night school at B. U. I see Charlie Bacon, II, of Middletown, Conn., occasionally. He is married and I understand is the proud father of a boy. I am still employed by the Connecticut State Department of Health and as far as work goes there is no depression for us. Glad to hear from you and the Class of '29 through The Technology Review."

Good work, Henry! I wish that more of the boys would gather a little news about our classmates and send it in for publication. The clipping that Henry mentions in his letter applied to the announcement of the engagement of Larry Moses.

Last but not least, I have it from one of Connie Sharp's (V) Boston girl friends that Connie and Ford Sammis '28 are now married and living in California. — EARL W. GLEN, *General Secretary*, Box 178, Fairlawn, Ohio.

COURSE X

A few of the members of Course X admit their existence. On January 25, I received the most auspicious news of the year. Mr. and Mrs. Glenn N. Andrews announced the birth of Priscilla Elizabeth on January 23. I expect by this time the original 7 lbs. 11¼ ozs. will have more than doubled. A later letter from Glenn tells us that he has acquired a new wife, a new car, and a new baby all within a year. And then sums up the economic conditions with: "I figure that when things improve, as they are now doing in our industry, I will be just that much ahead of the other fellow. As I see it now, we have a good job, and very good prospects, and why a fellow should be pessimistic under such circumstances is beyond me." Congratulations, Glenn.

Tacks Crosby has threatened to sit down and write further news from Hammond, but thus far no letter has materialized. — Franklyn J. Lammers has had a very varied and interesting time as excerpts from his letter indicate. "After one of the finest vacations ever spent in the woods bordering the Superior National Forest of Minnesota (as a guest of some very, very lovely young ladies — that was a wonderful summer and one of my few strokes of fortune, far from the thoughts of specific heats of saturated hydrocarbon vapors) I designed and produced combustion control equipment for the Carrick Engineering Company of Chicago. Part of my work was in the shops, part over the drafting board and slide rule, and part over a business desk; thus four months went by. One of my jobs was a complete control system for a steam-powered electric standby station for California Edison, to regulate all steaming equipment responsible for power. The plant was to take over the entire tie line load within a very few seconds, in case the regular hydros failed, and our equipment handles the power end.

"After a reorganization of the Carrick Company, I found myself as a sales and service engineer for the J. W. Murphy Company in Chicago still handling the Carrick account, as well as others — a sales and service agency for industrial power controlling and metering equipment. One of the first jobs in the new régime was the supervision of the in-

1929 Continued

stallation of four full panels of indicating and recording instruments — which I knew less about than the crew — in the very modern new power plant in the University of Chicago. I was gasping for air most of the time trying to keep up with myself.

"That business of bossing a crew was very pleasant, until one sunny morning when I tried to get a union plumber and his helper to separate and each do a different job! The sun promptly darkened and all was very chill while the fine points of the union rules and the impossibility of such a separation were scornfully pointed out to your humble correspondent.

"About a year ago I left the J. W. Murphy Company to accept an unusual opportunity with the International Filter Company of Chicago. They have given me a little office all my own, where one can sit and look at the lake if he ever has time, with a fine desk at which a decently responsible portion of the company's business of lesser importance is transacted in the form of drawing up specifications and proposals, interpreting analyses and the chemical engineering aspects of the job of water treatment, recommending various installations of our equipment, and some general business work, with a little advising and instructing of salesmen. Infilco, International Filter Company, deal only with water treatment and purification, in all its forms and applications — municipal, institutional, and industrial. My work could not be more interesting or educational, along business and technical lines both.

"The campus of Northwestern University, and less often that of the University of Illinois, have been very hospitable and afford frequent contact with some very enjoyable college life that I would otherwise miss. Best wishes to the rest of the fellows."

I don't know what Derry Churchill is up to, but he has certainly thrown the government off his trail. A letter addressed by your Secretary to the last known connection with the Standard Oil Company of N. J. was returned without making contact. — LAURENCE T. TUFTS, *Secretary*, 178 Alameda Street, Rochester, N. Y.

Technology Club of Chicago

On February 23, we succeeded in assembling about 30 members at dinner, after which Mr. Wilson of the Scientific Crime Detection Laboratory described the development and practical application of the Lie Detector.

As we have frequently learned, the Chinese anticipated this invention, it being reported that a group of suspects were required to swallow a handful of powdered rice. The innocent had no difficulty, but the guilty man's nerves dried up his throat and he choked. Likewise, some suspected chicken stealers were required to assemble in a dark barn and pass around in a circle while each man in turn pulled on a mule's tail. They had been informed that the mule would bray when the guilty man pulled his tail. No sounds being forthcoming, the lights were turned on and every man's hands were found covered with whitewash except those of the guilty man.

Leaving the humorous side, we learned that even though a man be nervous on account of examination, pulse rate, and breathing each establish a normal rate on record chart, so that it seems practically impossible to entangle an innocent person, while a guilty man — especially in the hands of someone experienced in handling the Lie Detector — repeatedly reacts to words or questions connected with his guilt.

A young officer advertised his car for sale and drove out with his prospective buyer, ostensibly to see a relative of the latter. He did not return, but a few weeks later a traffic violator a thousand miles away made such violent attempts to shake the officer from the running board of his car that the car was searched and certain insignia found and other incriminating evidence. The suspect reacted violently to the words "slab" and "cemetery" out of hundreds of other suggestions. After a long time the territory was narrowed down, location picked out and excavation made, resulting in the discovery of the officer's body.

One of our group at the dinner succeeded in puzzling the detector on some trivial questions, but one other man on equally trivial questions reacted definitely, especially when, after a period of quiet, a surprise question tripped him up, illustrating the need for having an expert conduct the interrogation.

We urge Alumni who plan to visit Chicago to telephone Lloyd C. Cooley at Randolph 0743 in order to learn the location of the Alumni Luncheon. — LLOYD C. COOLEY, '11, *Secretary*, 307 N. Michigan Avenue, Chicago, Ill.

The Technology Club of Cincinnati

The annual meeting of the Technology Club of Cincinnati was held Thursday night, February 25, at the University Club. As this was also Ladies' Night 22 of the fair ones lent their presence to grace the banquet tables around which were gathered 30 alumni: Oliver L. Bardes '21, W. E. Brotherton '73, A. Brown, H. M. Campbell '14, M. Carlisle '90, J. D. Cochrane, Jr. '23, L. T. Cummings '12, J. F. Dreyer '29, G. W. Elkins '25, S. Hooker '97, C. Kennedy '19, F. H. Kock '31, E. H. Kruckemeyer '11, W. H. Lee '96, H. D. Loring '07, A. P. Mathews '92, S. R. Miller '07, F. W. Morrill '07, J. S. Raffety '22, M. Sax '96, W. V. Schmiedeke '12, J. K. Sherman, Jr. '30, F. W. Spalding '22, C. H. Spiehler '08, J. B. Stewart '08, J. G. Strobridge '19, C. R. Strong '11, R. Tietig '98, C. H. Urban '91, and F. W. Willey '08.

After due appreciation had been shown to the chef's culinary efforts President John D. Cochrane, Jr. '23 took the floor to note some of the past year's achievements. Stuart R. Miller '07 reported on the scholarship fund and the excellent work now being done by the men whom the local club had sponsored thus far. However, when the secretary produced his voluminous report, the chairman of the entertainment committee, Rudolph Tietig '98, strenuously objected to the reading thereof. As the objection was boisterously seconded by the assembled multitude, the worthy secretary declared this tantamount to a vote of no confidence and called for a new election. Immediately the chairman of the railroad committee, Morten Carlisle '90, produced a train of new candidates for office as follows: F. G. Baldwin '06, President; J. S. Raffety '22, Vice-President; W. V. Schmiedeke '12, Secretary; O. L. Bardes '21, Treasurer; and Directors J. G. Strobridge '19, C. F. Cellarius '16, and C. H. Spiehler '08. *Viva voce* the choice was acclaimed and the Secretary was instructed by motion duly seconded and unanimously carried to cast the electing ballot for the officers as named.

The ladies had been cajoled into coming to the party by the announcement that the evening's festivities would be arranged for their specific enjoyment by America's foremost specification writer. As Rudolph Tietig '98 was chairman of the entertainment committee he was accused of being the aforesaid America's foremost specification writer, to which charge in deep humility he wished to plead guilty. However, that a just sentence might be passed upon such malpractice, he was formally indicted and brought to trial. The trial was featured by the fierce challenging of jurors, remorseless grilling of witnesses, marvelous exhibits of the *lost* word in architectural plans, renderings and specifications, marking a gigantic battle of twits between the prosecutor, Charles Kennedy '19 and Ed Kruckemeyer '11, counsel for the defense, who sought to prove mental aberration, before hizzoner Stuart Miller '07. As the prosecutor ended his peroration with an impassioned plea that an example be made of the defendant for the good of the contracting business, and that he be given the maximum penalty of serving ten years in the office of Fred Garber '03, both defendant and counsel swooned dead away. Subsequently the jury violently disagreed, and the foreman declared it "No contest." Verdict: A good time was had by all or else.

On the occasion of a following Tuesday luncheon the newly elected president, Frank Baldwin '06, was advised that he had been sentenced to serve one year in office and was duly presented with the bronze gavel and the brass key. With this increment of brass he has deftly assumed the title of Maximent I and has come out strong for an organized youth movement for less bureaux and more highballs. This presages a year of unusual activity ahead of the local club, which even now at the time of this writing has two special meetings on the calendar: one April 18 for Dr. Tryon and another May 17 for Dr. A. W. Rowe '01, newly elected President of the Alumni Association.

The same old welcome is extended to all Technology men visiting Cincinnati to drop in at the luncheons held every

Tuesday in the Bird of Paradise Room, Hotel Gibson. — WILLIAM V. SCHMIEDEKE, '12, *Secretary*, The Penker Construction Co., 1030 Summer Street, Cincinnati, Ohio.

New Haven County Technology Club

The January meeting of the New Haven County Technology Club was held on January 18 at the Y. M. C. A. in Naugatuck. Twenty-eight members were present and listened to very interesting talks by Messrs. Space and Schaeffer. Another meeting was held at the Faculty Club in New Haven on February 5. This meeting consisted of the annual dance, and 38 couples were present at this dance, while 12 couples sat down to dinner before the dance. — MARSHALL S. WELLINGTON, '16, *Secretary*, 60 Holcomb Street, West Haven, Conn.

M. I. T. Club of Northern California

The first annual meeting of the club since the formal reorganization last May, was held in the Clift Hotel, Wednesday evening, March 9. As guest of honor and speaker, we welcomed Professor C. Frank Allen '72, who for many years was connected with the Department of Civil Engineering at Technology. In addition to the privilege of meeting Professor and Mrs. Allen, we enjoyed a most interesting talk on Institute affairs and on Dr. Compton in particular. As Professor Allen put it, he thought he might tell us some of the things about Dr. Compton which Dr. Compton, himself, probably omitted to mention on his trip here last summer.

The following officers were elected for the coming year: John J. Thomas '07, President; George R. Norton '07, Vice-President; C. E. Harrington '23, Treasurer; Rolfe A. Folsom '18, Secretary; Forrest G. Harmon '23, Assistant Secretary; J. E. Woodbridge '93 and L. Standish Hall '14, Delegates at large on the Executive Committee.

A thrilling and melodramatic movie production entitled "The Wages of Cinema" rounded off a most enjoyable evening, which we expect will be a forerunner of many more under the leadership of the new officers.

A regular Tuesday luncheon is held weekly at the Engineers Club, 206 Sansome Street. Gatherings are informal, with no set program, but are always most worthwhile. All Alumni, whether residents or visitors, may be sure of a welcome. — ROLFE A. FOLSOM, '18, *Secretary*, 150 Hooper Street, San Francisco, Calif.

M. I. T. Club of Central New York

President Compton came to Syracuse on February 26 to give an address before the Technology Club. The subject of his address was "Science Sees the Invisible." About 500 people had the pleasure of hearing him.

Before the address the M. I. T. Club of Central New York entertained Dr. Compton at dinner. Among those present were: M. W. Bardwell '28, W. W. Beardsley, H. N. Burhans '07, Edward C. Booth '25, D. W. Diefendorf '30, C. S. Glenn '03, F. P. Hall '21, J. M. Hastings '12, W. E. Hopton '91, F. S. Hungerford '24, E. C. Kent '29, C. K. Lawrence '24, F. D. McKeon '26, L. G. Miller '27, Louis Mitchell '15, W. C. Phalen '99, R. A. Porter '06, B. Torrey, Jr. '12, J. R. Vedder '07, and F. W. Barker, Jr. '12.

Dr. Compton made a fine impression in Syracuse on all those who met or heard him. — FREDERICK W. BARKER, JR. '12, *Secretary*, First Trust and Deposit Company, Syracuse, N. Y.

Indiana Association of the M. I. T.

A meeting of the Indiana Association was held in Indianapolis on Monday, April 11, at which 10 members were present. An election of officers was held, resulting in the election of J. L. Wayne '96, President, Hermann A. Scherrer '03, Vice-President, and Edwin M. McNally '18, Secretary-Treasurer.

Following the dinner, the members adjourned to the rooms of the Indianapolis Camera Club to view an exhibit of photographic work of great merit. Dr. Bonns of our membership is President of the Camera Club and an expert in this line, as are also Messrs. Scherrer and McNally.

The club made plans to visit Purdue University on April 19 to meet Dr. Tryon on the occasion of his visit there under the auspices of Dean Potter. Preliminary plans were also made to greet Dr. Rowe on the occasion of his coming visit to Indianapolis in May.

The meeting unanimously declared itself for the continuation of Professor Charles Locke as its representative on the Council and expressed appreciation of his interest in communicating to us special information from time to time. — EDWIN M. MCNALLY, '18, *Secretary*, 814 North Senate Avenue, Indianapolis, Ind.

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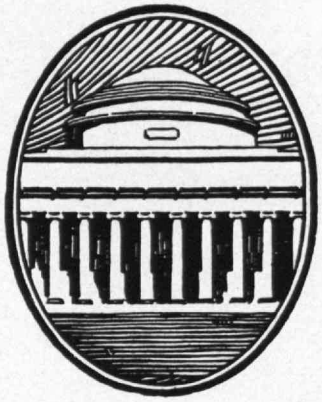

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Ask for the following circulars by their descriptive letters:

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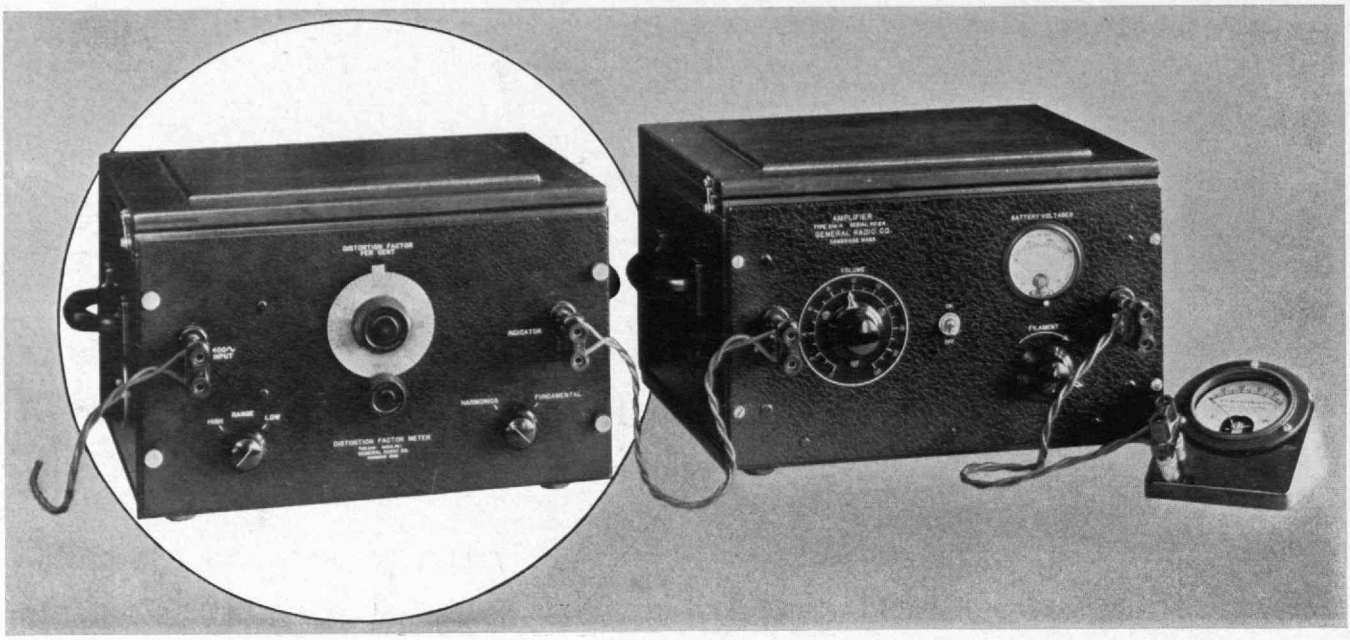

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General Radio Company, Cambridge A, Massachusetts

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